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PREFACE TO THE AMERICAN EDITION.

Toward the close of 1868 I informed Professor Vogel that I had taken the liberty of translating his excellent treatise on the Diseases of Children; he kindly and promptly replied, giving his consent to the publication of the translation, informing me at the same time that the work was also in the course of translation into the Polish language, and that the fourth edition of the original was just then in press and would be issued early in the year 1869. He very considerately forwarded to me the additional articles of the last edition, and recommended their insertion in my translation, in order to make it correspond in all respects to the fourth German edition.

The subjects alluded to are: (1), on the method of preparing the so-called Liebig's soup; (2), on sclerosis of the sterno-cleido mastoideus muscle; and (3), on rubeola—this last the author, in common with many eminent European physicians, regards as a separate and distinct disease from morbilli.

The facts of Vogel's "Kinderkrankheiten" having been translated into three other languages, and of its having attained to the fourth edition in less than eight years, together with the flattering commendations of the critics in various countries, and his belief in its utility and merit and its adaptation to the wants both of the practitioner and the student, must account for the translator having undertaken to render an English version of it.

The work will be found to be well up to the present state of pathological knowledge; complete without unnecessary prolixity; its symptomatology accurate, evidently the result of careful observation of a competent and experienced clinical practitioner. The diagnosis and differential relations of diseases to each other are accurately described, and the therapeutics judicious and discriminating. All polypharmacy is discarded, and only the remedies which appeared useful to the author commended.

Without in any way detracting from the merit of the numerous works upon the Diseases of Children which exist in our own and other languages, he ventures to assert his belief that the work of Vogel contains much that must gain for it the merited praise of all impartial judges, and prove it to be an invaluable text-book for the student and practitioner, and a safe and useful guide in the difficult but all-important department of Pædiatrica.

In the efforts at converting the original into our own vernacular tongue, all thoughts of elegancy as to style have been renounced; the only object aimed at was to present it in as clear and intelligible language as possible, to make the translation a worthy counterpart of the original, and to express the true ideas and intentions of the illustrious author; how well I have succeeded, time and the favor which it receives at the hands of the profession of this country will tell.

H. RAPHAEL.

NEW YORK, *August*, 1869.

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PART I.

INTRODUCTORY REMARKS.

CHAPTER I.

ANATOMO-PATHOLOGICAL REMARKS UPON THE INFANTILE ORGANISM.

A. Respiration and Circulation.—The first act of the new-born is to inspire. Immediately after birth the muscles of inspiration contract, and the air finds its way for the first time into the pulmonary vesicles. The increase in volume of the lungs consequent upon this act gives rise on the one hand to an outward enlargement of the thorax, but on the other to a compression of those internal organs of the chest in juxtaposition with the lungs, *i. e.*, heart, large blood-vessels, and thymus gland, and also to a depression of the diaphragm, whereby a palpable pressure is necessarily exerted upon the abdominal viscera. This sudden change in volume of both thoracic and abdominal viscera, in connection with other physiological alterations, leads doubtless .to alterations in the circulation of the different organs, and the following fœtal circulation, in fact, becomes established immediately or soon after birth.

(1.) *The Ductus Venosus Arantii* (Plate I., Fig. 2).—The umbilical vein arising from the placenta (Pl. I., Fig. 5), after its entrance through the umbilical ring, runs between the peritonæum and transversalis muscle to the liver, and through the fossa longitudinalis anterior sinistra backward to the left end of the fossa transversa. Here it divides into two branches, of which one, the larger, communicates with the portal vein, and the smaller, the *ductus venosus Arantii*, leads into the inf. vena cava (Pl. I., Fig. 3). The duct. ven. Arantii, therefore, connects the vena cava ascendens with the umbilical vein, but this connection, as well as that with the portal vein, ceases as soon as the placenta is expelled from the uterus, and the blood in the umbilical vein has become stagnant, and the first inspiration taken place.

(2.) *The Ductus Arteriosus Botalii* (Pl. I., Fig. 2) is, in the fœtus, a communicating canal between the pulmonary artery and the aorta. It arises at the point where the pulmonary artery divides into the two branches, then runs obliquely upward toward the lower border of the arch of the aorta, and joins the latter at a point opposite to where the left subclavian artery dips into it from above. It serves to arrest the blood in its course toward the lungs, and to conduct it from the right side of the heart directly into the great current again. The nearer the end of gestation arrives the smaller this vessel becomes, while the two branches of the pulmonary artery grow larger; the broader, however, this vessel is, so much the narrower is that portion of the aorta which lies between it and the heart. And now the lungs, dilated by the inspiratory muscles, not only draw in air, but also blood from the vessels; not only the *air-vessels*, but also the *blood*-conducting system of vessels, become distended. A stronger and faster blood-current passes from the pulmonary artery toward the lungs; the artery sends no more blood through the fœtal passage communicating with the aorta (*the ductus Botalii*), and the latter is so quickly obliterated, that in a child twenty-four to thirty-six hours old it is scarcely large enough to admit a probe.

(3.) *The Foramen Ovale.*—In the fœtus the auricular septum contains an opening (for. ovale), corresponding to the fossa ovalis in the adult. In this opening a semilunar membranous valve (valvula foraminis ovalis) is found, the upper border of which is free. In the fœtus this valve closes the foramen very imperfectly, so that a portion of the blood passes directly from the right into the left auricle, and thence, without permeating the lungs, into the general circulation. The nearer the end of gestation arrives, therefore, the smaller this foramen becomes, and the stronger and firmer the valve. After birth, the lungs are suddenly converted into a suction-apparatus, they therefore require a larger quantity of blood for their supply; the right ventricle also becomes distended, and thus the blood-stream is diverted from the foramen ovale. Although the border of the valve usually remains free for some months, still it is so well developed that it accurately closes the foramen. In children over eight to ten months of age, this border of the valve is generally found united with the corresponding border of the foramen ovale.

(4.) *The Umbilical Arteries* (art. umbilicales, Pl. I., Fig. 4).—Having spoken of the umbilical vein in connection with the closure of the duct. ven. Arantii, there only remains to describe the obliteration of the umbilical arteries. The two arteries originate from the corresponding arter. hypogastrica, are thicker than all its other branches, and pass upward along the bladder. They embrace the urachus and with it run upward between the abdominal muscles and peritonæum to the umbilicus. Passing through the umbilical ring, they run spirally in the cord, and reach the placenta, in which they divide and subdivide. As soon as the connection between the uterus and placenta has ceased, thrombi form in the umbilical arteries, reaching almost to their origin from the hypogastrica. These arteries remain pervious for a short distance from their point of origin, and here give off several arter. vesicales; in the female, in addition the arter. uterinæ. The remaining portion, between the arter. vesic. and the ring, ultimately becomes obliterated and converted into a fine white cord.

Together with these *mechanical* alterations, still more important *chemical* processes take place from the entrance of air into the lungs. Through the alternate action of air and blood, and the interchange of gases, which the walls of the capillaries lying against the pulmonary alveoli and the walls of the alveoli themselves have to transmit in two opposite directions, both air and blood are so altered, that the former becomes irrespirable, the latter arterial and thus qualified for nutrition. The new-born has now both arterial and venous blood.

Mention must be made here of an organ that solely belongs to the infantile organism, the *thymus gland.* The thymus is distinguished for great variation in size, weight, consistency, and form.

Embedded in the anterior mediastinum, it is sometimes confined to the space between the upper part of the pericardium and the roots of the large vessels, measuring in width barely half an inch, but sometimes reaching from the thyroid gland down to the diaphragm, and then measuring more than two and a half inches in width. Its principal arteries, according to *Jendrassic*, are branches derived directly from the large blood-vessels upon which it lies. According to the same author, to whom we are indebted for most of our knowledge concerning this enigmatical organ, the thymus is composed of two, often very unequal, parts, which are united by a membrane formed of several delicate laminæ, in which most of the principal vessels terminate. The form of such a thymus moiety most frequently met with is an oblong, the upper third sometimes thin and rounded, while the rest is more flattened and broader; a larger or smaller portion often curves upward like a horn from the lower end over the outer border of the gland. When the thymus deviates from this form, each half has the shape of thin cord-like stripes, or when of large size is divided into several rounded lobules, intimately united by a thin parenchymatous structure, lying near or upon each other.

In all instances the anterior surface facing the sternum is convex, the posterior slightly concave. The outer and lower borders are thin, often hem-like; the inner is blunter, provided with deep fissures, in which, as in a hilum, the blood-vessels dip.

At first the thymus is solid, firm, and granular, but in time becomes converted into a softer mass, in which many cavities may be found containing a fluid that almost always reacts with acid. The softening progresses from the central axis, where the principal veins terminate in an extensive deposit of connective tissue toward the periphery. The gland grows constantly flatter, its cavities approach one another more closely, so that no more of a glandular parenchyma can be seen, and at the time of commencing puberty it has, as a rule, completely disappeared. Exceptionally, however, it may be found in adults, and sometimes even of decided dimension and weight. In tuberculous children it is found infiltrated with tubercular deposit. Carcinoma of the anterior mediastinum, which in children occurs comparatively more frequently than in adults, most probably has its starting-point in the thymus gland. The numerously-repeated statements, that in syphilitic children abscesses are to be found in the thymus, are, according to *Jendrassic*, based upon an erroneous supposition, for, in most instances, the supposed abscesses are nothing more than the cavities that are regularly developed in the retrograde metamorphosis of the gland, and are also found in children who are perfectly free from syphilis.

B. SECRETIONS.—All the mucous membranes, which in the fœtal state produced but a slight amount of secretion, commence after birth to secrete their peculiar fluids. The mouth and nasal cavities become moist and lubricated, the latter often very imperfectly, so that it frequently becomes necessary to remove the dried mucous crusts. The salivary glands, it is true, also secrete a fluid, which, however, has not, as yet, the same perfect chemical properties as in the adult, for it is only able to very slowly convert starch into sugar. The stomach likewise begins to secrete a fluid, which dissolves the caseine contained in the milk of the mother. The liver, which fills up the greater part of the abdominal cavity, secretes a light-brown bile, which gives to the fæces, after the dark-brown meconium has been evacuated, an orange-yellow color.

The generally prevailing opinion, that the *meconium* is a mixture of bile, intestinal mucus, and intestinal epithelium, has been proven by *Foerster's* investigations to be incorrect. It consists rather of flat scales, which possess all the characteristics of flat epithelium, and consequently could not have originated in the intestinal canal, resembling in their entity those of the vernix caseosa: and, in addition, of fine hairs, in the same quantity as in the latter, fat-globules of various sizes—evidently cutaneous fat (Hauttalg, smegma cutaneum) peculiar to the vernix caseosa—crystals of cholesterine (which may partly originate in the bile, or may be retrograde products of the vernix caseosa), and irregular brownish and yellowish lumps and flakes, which give to the meconium its dark color, and without doubt the coloring matter of the bile. It is therefore evident, that the meconium, excepting the last-mentioned substances, which originate in the bile, consists principally of *vernix caseosa;* and from this it may be inferred that the fœtus from time to time has swallowed a tolerably large quantity of amnion containing the vernix caseosa in suspension, the water of which is quickly absorbed by the stomach, for none is ever found in it, but the hairs and scales pass through the whole intestinal tract as indigestible substances.

After birth the intestines secrete a certain amount of mucus, an excessiveness or deficiency of which will give rise to diarrhœa or constipation, the first and most frequent diseases to which the nursling is subject.

Quite a severe task is imposed upon the kidneys immediately after birth. In the first few days children drink but very little, the blood consequently can part with only a very small quantity of water, and thus it happens that the uric acid salts, the result of the great metamorphosis of the tissues, quickly accumulate in the urinary tubules, remain undissolved there, and from this too highly concentrated solution the product that has been called the *uric acid infarction* of the new-born is deposited. The uric acid concretions are yellowish-red or pink-red casts of the pyramids near the papillæ. Generally they appear for the first time on the second day after birth, and last from five to twelve days, but I have also found them in children more than four weeks old. As this condition has been said to exist in the still-born, in very exceptional cases it is true, and, since a considerable number of children who die between the second and fourteenth days do not exhibit it, no very great medico-legal value can therefore be placed upon it. It is frequently found as a carmine red powder in the diapers of the new-born, an occurrence that has also been noticed by some observing midwives. Microscopic examination reveals minute columns composed of cylindrical, amorphous, urate of ammonia, and epithelium cells, with here and there solitary rhomboid uric acid crystals. On the days this powder is found in the diapers, the children are usually restless, cry on micturition, and have an inflamed meatus. Although its origin and excretion must be regarded as physiological, nevertheless it cannot be denied that kidney gravel, so frequent in children, as well as the occurrence of urinary calculi in childhood, has some connection with it.

The skin, which during fœtal life was continuously of the temperature of the maternal blood, with the act of delivery becomes a colder medium, for now it is subject to the impressions of the air, light, and changes of temperature, and also assumes the function of secretion. At birth it has a uniform red color, which, however, between the second and sixth day, changes to a yellowish and then into the ordinary rosy-red tint. The yellowish color is often erroneously regarded as icteric. New-born children are covered almost all over the body, with the exception of the palms of the hands and soles of the feet, with fine, soft, often tolerably long hairs (lanugo), which fall out in the first weeks of life. So, too, the strong hairs upon the head with which children sometimes come into the world, fall out in the first weeks of life, and are only slowly replaced by a fine, generally light-colored growth of hair. Feeble children, of slow development, and those devoid of solid adipose tissue, retain these first hairs much longer than those which develop rapidly. In the first weeks of life the sweat-glands perform their function but very imperfectly; it is almost impossible to bring a child, under four weeks old, into such a state of transpiration that the perspiration will gather in drops.

On the other hand, from the beginning of the second month up to the end of the first year, the secretion of the sebaceous glands of the scalp in almost all children is increased in amount, forming seborrhœa capillitii, which should be classed with the physiological conditions. This seborrhœa capillitii develops very gradually; at first, the scalp looks as if it had been smeared with tallow or cerate; upon this hard skin dust and dirt become adherent, and, with the lardaceous secretion of the skin, dry into grayish-white or yellowish, and, subsequently, into brown and even black scabs, which crumble easily between the fingers, become detached, and leave the scalp in a healthy, uninjured state, and not even congested. It is not attended by any itching, moisture, or cutaneous infiltration. By a diligent application of olive-oil, and washing the head with soap and water, this formation of scabs may be arrested without any danger to health. In many places, in Munich for instance, the midwives have accused this affection of being a *noli me tangere.* It is but seldom possible to persuade the mothers to try the just-described method of treatment, most of them leaving the brown scabs untouched till the end of the first year, when the seborrhœa ceases spontaneously, and the scabs, by the constant growth of the hair, are separated more and more from the scalp, and finally dry up and crumble away. Afterward, no simple seborrhœa capillitii ever occurs in children.

C. THE GENERAL GROWTH OF CHILDREN, AND OF SPECIAL PARTS OF THEIR BODIES.—The child grows most rapidly in the first weeks of life; in the first year, from six to seven inches. From the fourth or fifth year up to the sixteenth, its growth is tolerably regular, and amounts yearly to two inches, more or less. From the sixteenth to the seventeenth year, the body increases only one and a half inches; in the two succeeding years only one inch. Most persons grow only to the end of the twentieth year, but in some growth is only completed at the end of the twenty-fifth year. Imperfect nutrition, and too hot and too cold a climate, hinder growth. Acute febrile diseases interfere in no way with it; on the contrary, they accelerate it most decidedly, and this is especially true of the acute exanthemata. In an acute febrile disease of a few weeks' duration, children often grow a half or one inch, while in the physiological state this would take three or six months time. Indeed, they even appear to have grown more than that amount, on account of the great emaciation that ensues. Diseases of the bones, rachitis, and scrofulous affections, retard the growth. When children grow too rapidly, they become emaciated, weak, pale, and inert. In about one and a half to two months the child begins to hold the head erect and to turn it voluntarily, especially toward the light. Not till the seventh or eighth month does it learn to sit, and still later in the ninth and tenth the functions of the lower extremities are developed, the child beginning to stand, and several weeks thereafter to walk.

The growth of all parts of the body does not always progress uniformly; often the head grows more than the other portions, and the extremities more than the trunk and head; most frequently the thorax, in consequence of our defective physiological rearing, is much retarded in development as to its breadth.

Sometimes it is of importance to accurately decide the dimensions of the bones of the skull, and the following points of measurement have therefore been agreed upon: (1.) *The largest periphery of the head.* For this the measurement is taken from the tuberosity of the occipital bone to the greatest prominence of the frontal bone. In marked chronic hydrocephalus the occipital bone is more horizontal, and the largest periphery, therefore, strikes above the tuberosity of the occiput. (2.) *The measurement from one ear to the other.* It runs from the upper part of attachment of the auricula over the greater fontanel to a point opposite. (3.) *The measurement from the occiput to the root of the nose,* is from the occipital protuberance over the top of the head to the glabella. These three measures may be taken with some strips of paper, or still better, with a tape measure divided into half and quarter inches. The diameters must be measured with a compass. The transverse diameter has its terminal points at the protuberances of the two parietal bones, the longitudinal diameter at the lesser fontanel and the greatest protuberance in the centre of the forehead.

A thorough knowledge of the greater fontanel and its physiological closure is of great importance to the physician. The fontanels are conditional upon the development of the skull. The angles of the bones of the skull will necessarily have to be the last formed, as the process of ossification of the fœtal skull progresses from several points of ossification, which, by the addition of ossific matter to their peripheries, grow uniformly in every direction. But since the cranial bones at first have a roundish contour, there will remain, when the several plates of bone come together, a space between them, which will have as many margins as bony plates. These openings, covered only by a membranous tissue, are called fontanels. Now, since the parietal bone in its developed state has four angles, a fontanel would have to form at each of these in the embryonic state, but as the upper angles of both parietal bones lock together, so that their fontanels coalesce, only six fontanels can be produced, of which the frontal and occipital are single, but the anterior and posterior parietal fontanels, on the contrary, are disposed in pairs.

In a child at full term, only the large four-cornered frontal fontanel exists, the square of which forms a rhombus, with unequally inwardly-curved borders. It originates from the union of the two frontal and the two parietal bones; the angle formed by the union of the frontal bones being sharper than that formed by the union of the two parietal. The greater fontanel seldom closes completely before the end of the second year. *The enlargement of this fontanel till after the ninth month of life* is a very remarkable occurrence, to which *Elsaesser* first called the attention of the profession. To ascertain its size, *Elsaesser* chose a method by which probably a more precise and at least more relatively definite determination of its square space is arrived at, while at the same time it supplies a briefer expression. He measured the distance of two parallel sides, lying opposite each other, from their centres outward, the distance of the two other parallel sides was then similarly ascertained, the two numbers resulting therefrom were then added together, and the half of that was accepted as the diameter of the fontanel. This method furnishes more exact results than when the measurement is taken from one *corner* to the opposite one. In the latter case the result is wholly unreliable, because the angles often extend tolerably far into the sutures in the form of very narrow fissures, whereby the boundary from which the measures are to be taken is always subject to arbitrariness.

The relative sizes of the anterior fontanel were in the trimesters as follows:

Trimesters.	No. of Children.	Average Diameter of the Fontanel in French lines.
1 to 3 months.	10	9 60
4 to 6 "	15	11.93
7 to 9 "	7	13.90
10 to 12 "	13	11.88
1 to 12 months,	45	11.60
In this period the fontanel is always open.		
13 to 15 months.	9	7.77

Of these nine children the fontanel is closed in 3, in one 5, in the rest 10 to 15 lines wide.

16 to 18 months: eight children. In 4 the fontanel is closed; in the rest 2, 3, 9, and 10 lines wide.

19 to 21 months: five children. In 2 closed; in the rest, 5, 12, and 12 lines wide.

22 to 24 months: seven children. In 5 closed; in the rest 9 and 15 lines wide.

From this it follows—

1. That the anterior fontanel, during the first year of life, is smallest in the new-born, and in the course of the first trimesters.
2. That it then *increases in size* up to the third trimester; and,
3. It does not decrease again till the fourth.

The question which instantly strikes one here, "How is this enlargement of the circumference of the greater fontanel to be explained?" may be answered, according to *Elsaesser*, in the following mechanical way: The greater fontanel forms a square, with its angles directed forward and backward, right and left. Through the angles two bony fissures of the skull run, a transverse (the coronal suture) and a longitudinal one (sagittal and frontal). Now, if we suppose that the surface-growth of the bones of the skull occurs in this wise, that on their borders new layers of bony substance are constantly formed, the relative bones will be driven asunder by the newly-formed epiphysis on the borders of each suture. Now, if this happens to the *fissures terminating at the fontanels*, then they will necessarily grow larger in every direction, if their borders do not also grow at the same time. The borders, however, of the fontanels do indeed grow, but only in the same proportion as the margins of the sutures, and this suffices to explain the mechanical enlargement of the fontanel. If we think but a little further, that if only one of the above-named principal sutures—the transverse for example—receives new additions of matter, the other, the longitudinal, remains unaltered, supposing, still further, that on each border of the transverse suture material is added in a certain period of time, amounting to the breadth of one French line, then the fontanel at the expiration of this period will in this case have its old diameter again, although the borders have grown by one line within that same period of time. Thus, then, a uniform growth of all the borders of the bones has been presupposed, the diameter of the fontanel remaining unaltered, if only one suture passed through it, or if no addition of substance whatever took place. But the latter occurs in the longitudinal suture in the same proportion as in the transverse. And since, in the growth of the borders of the transverse suture by one line, the borders of the fontanel must also grow by one line if its diameter should remain the same, then the same results in the longitudinal suture, if, uniformly with the transverse suture, it grows by one line in breadth; or, in other words, if the diameter of the fontanel is to remain unaltered during the time in which the borders of the transverse and longitudinal sutures grow by one line, it must increase by *double the quantity*, namely, by two lines. This, however, does not take place, the fontanel growing in about the same proportion as the margins of the sutures (thus, in the presumed period of time merely by one, not by two lines), and it must, therefore, constantly increase in circumference. This is also actually the case. To whom the preceding explanation should not be distinct enough, let him take the trouble to cut out from paper four times the two contours, Pl. II., Figs. 1 and 2, and then to set them together with the blunt angles in such a manner that the fine lines *a* and *a'* of each figure will form a square.

Fig. 2 represents an accurate drawing of one of the bones of the skull which has participated in the formation of the greater fontanel, the plate of bone having increased in a given time by one line all around from its original size, as in Fig. 1.

So long as the borders of the sutures continue to grow in the same proportion as the borders of the fontanels, the steady enlargement of the fontanel naturally will continue. But a period arrives when the borders of the sutures become ossified, forming *seams*, in a more limited sense, and the entire head at the same time enlarges at a slower rate. The result of this is, that the bony margins cannot further separate or be displaced, and that the unchecked continued growth of the ununited fontanel-borders has for its object the gradual diminution of the fontanel. The period of the simultaneous formation of the sutures, and the diminution of the fontanel, in healthy children, occurs about the ninth month. The fontanel does not, however, become completely closed till after the fifteenth month.

The enlargement of the greater fontanel in the first three trimesters is, therefore, neither pathological, nor rachitic, but a physiological condition.

The purpose of the greater fontanel is considered in a one-sided manner, from its negative point of view only, deficiency of firm ossified covering, while its form, position, increase of size, taken in connection with the whole development of the child, show an actual, positive purpose.

The skull and spinal column together form a firm, unyielding casing around the brain and spinal cord, so that the contents of the skull and the spinal canal can neither increase nor diminish in volume. Now in the first year of life, when the brain grows rapidly and is more predisposed to congestion than subsequently, an absolute fixation of the skull would not allow this physiological growth, consequently the greater fontanel exists as an elastic point, acting very much in the manner of a safety-valve.

While in congestion of the brain, and hydrocephalus, it bulges and arches outwardly, and thus lessens the pressure of the plethoric vessels or hydrocephalic effusion upon the brain, in cerebral anæmia and atrophy of the brain it arches inwardly and forms a depression on the top of the skull.

The brain grows most rapidly in the first months of life; at birth, it weighs less than one pound; in the second year nearly one and a half pounds. In the new-born, the cerebral substance is soft, almost homogeneous, and is not well defined into gray and white, or cortical and medullary substance. In the first year the dura mater is always, in the second quite frequently, firmly adherent to the calvarium, so that, in opening the skull, the dura mater has to be removed simultaneously with the calvarium. It therefore seems superfluous to describe this phenomenon as peculiar in the autopsy of every child under one year of age, as is the case in most reports of autopsies, in which also a special amount of stress is laid upon it.

THE ERUPTION OF THE TEETH.

The formation of the teeth, according to *Hyrtl*, begins as early as the first third of embryonic life. In the sixth week of pregnancy, according to *Goodsir*, narrow little grooves form at the future site of the maxilla between the barely-recognized lips and the rudimentary arch of the jaw. The margins of these grooves increase to ridges, by which the fissures are converted into excavations or inlets. At the bottom of these inlets little roots spring up, between which the curved ridges dip down and form cells for the roots. Every cell communicates with the mouth by an opening which, through the convergence of its borders, subsequently becomes closed. Thus the dental sac originates, and in its depth the dental papilla is implanted. The dental papilla serves as a nucleus for the deposit of the tooth-substance (cementum), the enamel being formed by the enamel germ, which crowns and envelops the head of the papilla, and into which the latter grows. In this manner the dental sacs of the first twenty teeth are developed, their ossification following in the fifth month of intra-uterine life. The sacs for the *permanent* teeth sprout on the posterior walls of the deciduous dental sacs, probably with hollow communications. By increasing growth they become cut off from these, but still hang to them by a thread-like attachment (gubernaculum dentis). All the sacs of the milk and permanent teeth are present in the maxilla of the new-born. The deciduous teeth in time grow upward toward the alveolar borders of the jaw, which is closed by cartilage. The cause of this upward growth is the successive development of the dental root. The cartilage of the gum and the upper wall of the dental sac disappear simultaneously. And the lateral walls of the dental sac become the periosteum of the dental root. Sometimes the cartilage disappears before the crown of the tooth has reached the upper surface; the erupting tooth then lies freely exposed in a shallow depression of the gum; often, however, it cannot be seen, but only felt, and is discovered by striking upon it with a spoon-handle—an experiment which may give much pleasure to the parents who are impatiently waiting for the appearance of the first tooth.

Attended by increased secretion and redness of the mucous membrane of the mouth, and various other symptoms to be treated of in the special part, the eruption of the first milk teeth begins. In the majority of healthy children the twenty deciduous teeth appear in the following five groups:

GROUP I.—Between the fourth and seventh months of life the two lower middle incisors appear almost simultaneously, whereupon a pause of three to nine weeks ensues.

GROUP II.—Between the eighth and tenth months of life the four upper incisors appear, following shortly upon each other. At first the two central, then the two lateral. The second pause amounts to from six to twelve weeks.

GROUP III.—Between the twelfth and fifteenth months of life six teeth appear at once, namely, the four first molares and the two lower lateral incisors; generally the molares in the upper maxilla first, next the lower incisors, and lastly, the molares of the lower jaw. A pause until the eighteenth month now ensues.

GROUP IV.—Between the eighteenth and twenty-fourth months of life the canine teeth cut through (the upper ones are called eye-teeth). Again a pause until the thirtieth month.

GROUP V.—Between the thirtieth and thirty-sixth months, the second four molares finally make their appearance.

This concludes the first dentition. The child has now twenty milk-teeth. In the fifth or sixth year of life the first molares cut through, and with them the second dentition begins. The arteries of the deciduous teeth become obliterated and their nerves disappear, and as they are thus deprived of their vitality they become loose by the enlargement of the alveoli and finally fall out without previously becoming carious. As the infantile maxilla is not large enough to allow the permanent teeth to be developed in a single row, the permanent canine is therefore compelled to grow in front of the external incisor and first molar, and to this remarkable situation of the canine tooth is also frequently due its faulty position after it has cut through. The *partition wall* which separates the alveoli of the permanent teeth from those of the milk-teeth is after awhile absorbed. In order that the first may follow the latter, and that they may not grow amiss, the constricted cord between each milk-tooth and the corresponding permanent tooth is again transformed into an open passage. The milk-teeth fall out again in about the same order as they appear. In the twelfth year the fourth molar appears, and finally between the sixteenth and twenty-fourth year the fifth molar, also called *wisdom-tooth*, the crown of which does not begin to ossify till the tenth year.

Although it cannot be maintained that all healthy children cut their teeth in the above-described order and time, yet this much is certain, that those children who follow this order suffer the least from the difficulties and sequelæ of dentition. Under the irregularities of physiological dentition the following observations in particular may be made. (1.) Irregularity in time: Children sometimes come into the world with teeth, as Louis XIV. and Mirabeau, without subsequently having a quicker general development. (2.) Irregularity in succession: Occasionally the upper incisors appear before the lower, and in such cases the lateral generally before the central; very rarely do the canine appear before the molares.

CHAPTER II.

GENERAL RULES FOR THE EXAMINATION OF CHILDREN.

VERY small children, only a few weeks old, are very indifferent to a professional examination; they sleep much, and feel so comfortable when relieved of the firm bandages * for a little while, that they are rarely restless and unquiet. But when they once begin to recognize and distinguish surrounding objects, as is often the case with children three months old, every strange face frightens them, therefore also that of the physician who is called in to attend them. In some children this timidity lasts only till the eighteenth or twenty-fourth month; sometimes it decreases, sometimes again it increases, in others it persists till the fourth or sixth year. Much depends, however, upon the circumstances under which the child grows up; it will be the more timid, the fewer persons it has an opportunity to see; children that grow up in the city are, therefore, less timid than those reared in the country.

There are three circumstances which act as obstacles to the child's physician: the absence of speech, the marked agitation which the examination always induces, and, lastly, the crying which often accompanies this agitation. The first obstacle, of course, cannot be removed; it may, however, in a measure be replaced by a well-directed, comprehensive interrogation of those in charge of the child; the last two, on the contrary, must be avoided.

When a child has been washed, and nursed, or fed, it generally falls asleep; and, as these necessities in respectable families are attended to at about the same time every day, it is therefore very easy to observe and examine the child while asleep, and for this purpose it should be dressed in such light garments as will not necessitate its disturbance in removing them. Its sleeping is favorable for that examination which can only be fully appreciated when carried out with the utmost quietness—that part of the examination which can be made regardless of the agitation and crying may be deferred till the child is awake. From this it follows that the examination of sick children must be undertaken at two separate periods of time, namely, during its rest and during its agitation. The expression of the countenance, the attitude and involuntary motions of the body and ex-

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* In Germany, and most of the countries of Europe, the entire body of the infant is bandaged with a long, broad cloth.—TR.

tremities, the pulse, the kind and number of the respirations, and the results of auscultation, can only be properly noted *during rest*. The skin, its color, temperature, and morbid alterations; the mouth, the abdomen, genitals, anus, the extremities, the manner of nursing, and, above all, the cry, may be examined during the agitation.

The expression of the countenance betrays the sensations of even the youngest infants tolerably distinctly, and may greatly aid the experienced observer in the recognition of diseases and the formation of a prognosis. *Eusèbe de Salle* very correctly observes that the healthy nursling has a totally expressionless physiognomy, in which every one, a mother perhaps excepted, must agree with him. The fact is all the more important, that sick children have a certain expression of countenance, in great part due to the disappearance of the adipose tissue from the subcutaneous tissues; in part, however, this is due to a peculiar contraction of the otherwise relaxed facial muscles.

The expression of the countenance of a previously healthy, robust child becomes so rapidly changed in every profuse diarrhœa, and especially in Asiatic cholera, that it is often barely possible to recognize it again in twenty-four hours. The eyeballs sink back into the orbita, so that the lids are scarcely able to cover the bulbs, and a fold (corresponding to the lower border of the orbit) forms in the lower eyelid; the nose becomes pointed, and the previously plump, ruddy lips become sharp and thin.

In chronic atrophy, also, the last traces of adipose tissue disappear from the face; the integument everywhere becomes loose and corrugated, and, in addition, various contractions of the muscles take place, as a result of cerebral irritation, especially that of the frontal, next of the corrugator supercilii, and the levator alæ nasi et labii superioris muscles, by which the face acquires a senile appearance, and, on account of which, the French Pædiatricars, in a very ungallant manner, call it a Voltairian face.

Jadelot has described three expressions of the countenance, which he claims indicate the existence of internal diseases. The first expression begins at the internal angle of the eye, and becomes lost upon the zygomatic process. He calls it "le trait oculo-zygomatique." The second starts from the upper part of the wing of the nose and surrounds in a semicircle the external border of the orbicularis oris. This divides into two parts, into the nasal-expression (le trait nasal), and into that of the cheek (le trait génal). The third expression begins at the angle of the mouth, and becomes lost toward the chin. The first, it is claimed, denotes affections of the brain; the second, affections of the abdominal; and the third, those of the thoracic organs. It is scarcely necessary for us to suggest to the reflecting physician that this is mere fantasy. Alas! it will not be made so easy for the physician to recognize and diagnose a disease by merely inspecting the face. But there is one single sign characteristic of a certain disease found in the face, namely, the rising of the alæ nasi with every inspiration, by which we are able to diagnosticate, with the greatest certainty, an inflammatory affection of the lungs.

As regards the attitude and movements of the child, the new-born is always apt to assume that bodily position which it occupied within the uterus. The back is bent a little outwardly, the head flexed upon the chest, and the limbs are bent upon the body. When a child lies quietly, sleeps soundly and uninterruptedly, and is tolerably active when awake, then it may be satisfactorily concluded that it is in excellent health. There is a decided contrast between this state and the condition of powerlessness and stupor. In the former the mobility of the child is abolished, it lies then apathetic; in the latter, on the contrary, the eyes are staring, and follow no more the eyes of the mother, or of the nurse; as is the case even with very small, healthy nurslings, of but four weeks old, the eyelids cover only half of the cornea, and do not become completely closed even during sleep.

If children throw themselves about unceasingly, and find no rest in any position; when they have a heightened tempreature of the skin, with an accelerated pulse, and then become tranquil without any diminution of the fever having taken place, this remission is only the result of increasing weakness, and may be regarded as an unfavorable sign. In exudative affections of the brain, children often flex the head backward; in cerebral atrophy, as a result of general atrophy, they will constantly rub the occiput on the pillow, or bore the head into it, and with their little hands pull their hairs and ears. Healthy children, when tired, fall asleep in any posture and quietly continue to do so; but in pneumonia, in most instances, they choose the dorsal decubitus, or lie on the affected side, and will immediately turn over if they happen to be placed upon the unaffected side. Children with scrofulous inflammations of the eyelids, and sometimes those with cephalic pains, lie upon the face.

When infants during nursing, or shortly after that, are laid upon the left side, they generally become restless and begin to vomit; this is apparently owing to the enormous size and weight of the liver, which in this position presses upon the stomach. For that reason also do nurslings suck with more ease at the left breast, for, being oftener put to this one, more milk is usually found in it than in the right. This argument is quite probable, from the fact that nurslings who obstinately refuse to suck at the right breast will very often take it without any objection as soon as their lower extremities have been put under the mother's right arm and they are allowed to *nurse while lying upon the right side.*

Children frequently point directly to the site of the pain with the hands. During dentition they feel about in the mouth, in hydrocephalus and cerebral irritation they will pull at the hairs (but sometimes also at the genitals), and in croup they press and rub themselves about the neck; older children, when suffering from colic, press with their hands upon the abdomen, or when suffering from pain in the bladder, which is often caused by vesicants, upon the organ. When affected with worms, they will pick and bore at the nose and anus. Atrophic children keep their thumbs drawn inward and the hands shut firmly. The flexing and extending of the lower extremities by starts and jerks, attended by crying, are the ordinary signs of flatulence, and cease as soon as the flatus has been discharged.

The examination of the pulse can only be carried out with success in a *sleeping* child. In one that has waked up suddenly, or has become agitated through much handling, the physician will find that he has to battle with insurmountable difficulties. The child seeks in every manner to twist itself loose from his grasp, and the firmer the arm is fixed, the tenser does the child make its muscles, and it often becomes wholly impossible to feel the pulse.

Various measures have been suggested by which we might be enabled to feel the pulse in a child, such as to allow it to suck at the breast or bottle. But the act of sucking always accelerates the respiratory and the cardiac actions, and for this reason no useful information whatever can be obtained by this method. It is best, therefore, to quietly approach the child while asleep, lightly compress the radial artery with the end of the index-finger, and, when it moves its arm, accompany it in all its movements without the least resistance; after the removal of the fingers the child usually sinks again into a sound and lasting sleep. But if the restlessness of the arm continues, the examining finger should be withdrawn, because otherwise the child will surely be awakened, and no time is so unfavorable for examination by the physician as that after awaking from sleep. The neglect of these precautionary measures will doubtless serve to explain the reason why most authors state the pulse of the nursling infant to be so high, 130 to 140 beats per minute. Valleix, physician to the Foundling House at Paris, has found the medium of the pulse in thirteen healthy sleeping nurslings, from three to twenty-one days old, to be 87 (minimum 76, maximum 104).

In twenty-four healthy sleeping nurslings, I found the minimum 92, maximum, 136, medium, 109 per minute. It is still more difficult, on account of the smallness of the artery, to discriminate between a hard and a soft pulse. Undoubtedly, our chief attention in nurslings should be directed to the rhythm of the pulse; an unrhythmical, interrupted pulse occurs in cardiac affections and cerebral diseases. Great frequency of the pulse-beats in children has much less significance than in adults, for that condition is induced by the least excitement and the most trivial pain. Slowness of the pulse is observed in sclerema of the new-born, and in cerebral compression. In many instances before death the pulse is altogether imperceptible for one or several days.

The examination of the *respiratory organs* in small children is attended by the greatest difficulties, occasioned as much by the smallness of the affected organs as by the restlessness and refractoriness of the child. The physical examination embraces inspection, percussion, auscultation, and palpation, the first two of which can only be performed during perfect quiet, but the last two even in crying children.

Inspection.—First of all, as regards the number and kind of respirations in children who have not yet passed the first year of life, it appears, from the very positive statements of the most conscientious authors, that upon this point no definite normal numbers can be given. These statements fluctuate between eighteen and thirty-five respirations per minute. Above all, we must remember that the respirations, even of healthy children, are not alike during sleep and wakefulness. Only during sleep is respiration performed in a perfectly regular and rhythmical manner. Sixty experiments, which I instituted in twenty-two sleeping children from three to four weeks old, gave me, as a medium, 26.4 inspirations per minute. As soon as the children are roused and have become somewhat lively, the respirations are changed by every touch, every unusual noise, and every change in the light of the room; the interval is longer than usual, and is followed by a few short, very quick or deep and slow breathings; and, if the children now begin to cry at all, the rhythm will be entirely abolished; in general, however, the respirations increase in frequency during crying. Owing to this great physiological variation, no diagnostic conclusion can readily be arrived at from any small deviations from the medium number.

In children who have passed the first year of life, the respiratory acts are more uniform in the wakeful state. In pulmonary affections, which occur extremely often in childhood, particularly lobular pneumonia and rachitic carnification, the breathing is accelerated from two to four fold, consequently to fifty or eighty in the minute, without any mechanical hinderance, solidification of large portions of the lungs with exudations being physically demonstrable. In later years, after the completion of the second dentition, certain diseases only abolish the rhythm, especially all those cerebral affections which are capable of exercising a serious pressure upon the cerebral substance, above all, acute hydrocephalus; furthermore, large cerebral tubercles, carcinoma of the brain, and sometimes also meningitis and cerebral hæmorrhage, if the amount of pus or blood upon the meninges has attained to a certain quantity. In these cases, the respiratory acts are remarkably irregular, alternately retarded and accelerated, deep or sighing.

As regards the respiratory actions, we have in the healthy child abdominal respiration predominant, i. e., the diaphragm contracting stronger and firmer than the muscles of the thorax; the upper part of the chest is almost entirely undistended; the lower portion, however, is all the more markedly expanded, so that more of a change of form of the abdomen takes place than of the thorax. The manner of breathing varies greatly in various pectoral diseases; the various deviations will more appropriately be spoken of in connection with the individual diseases. A careful inspection of the thorax is very important, and often supplies many clews, even before the actual physical examination has been commenced, which, on the whole, in the restless condition of the child, is often unsatisfactorily accomplishable.

Percussion of the infantile thorax is best executed without a pleximeter or hammer, finger upon finger. The excellent rule in surgery, to avoid using all instruments that can be replaced by the hand, is here all the more applicable, as children, especially those between two and three years of age, have an insurmountable dread of the hammer and pleximeter, whereas by gentle and tender management they will readily allow themselves to be percussed with the fingers. Children carried about upright are best percussed in the arms of the mother. In these, the dorsal surface, upon which the greatest attention is to be bestowed, offers itself most conveniently, and the youngest children most readily submit themselves to be percussed when they are in direct contact with their mother. Young infants should be percussed in the lateral decubitus, from which little opposition will seldom be encountered. That the hands should be warmed before they are laid upon the naked body of the child, is self evident. Physicians who suffer from cold and moist hands will not particularly succeed in the children's practice.

The percussion-stroke should be made absolutely softly, gently, *and slowly, and should be continued long enough on one spot until there has been a chance to percuss in the moment of the deepest inspiration and most complete expiration; for this purpose, ten and even more blows will often be requisite.*

A *forcible* percussion, such as is requisite on the back of an athletic adult, is, on account of the elasticity of the thorax and the smallness of the organs to be examined, never allowable in children. The percussion is not made plainer thereby, but other parts, generally the intestines, are made to resound; and, besides, the child is instantly and surely frightened by strong blows.

Percussion should be performed *slowly*, because the examiner always requires a certain amount of time to appreciate the sound produced, and to form an opinion of it. The most experienced ear is unable to detect the finer variations of the sound produced by the usual rapid thumpings.

The same place is to be percussed until the deepest inspiratory and expiratory moment is caught, because only by comparing and properly estimating the two percussion-sounds thus obtained, and which *always differ* from each other, is a thorough investigation of the percussed part possible.

I must call special attention to a phenomenon which, in spite of its daily occurrence, has nowhere yet been properly estimated, and still less satisfactorily explained, namely: when both lungs of a healthy child are percussed by way of comparison on the back, from birth up to the second and even the third year, there is found on both sides, so long as the child breathes calmly, and makes no noise whatever, a sonorous, feeble, or strong tympanitic percussion-sound; as soon, however, as it becomes disturbed or restless, or when it resists the examination, and proclaims its unwillingness by a pressing outcry, then *the whole condition is suddenly changed.* Instead of the equal sonorous tympanitic sounds of both sides, a moderately dull percussion-sound prevails over the left lung, and a flat, empty sound over the right lung as far upward as the spinæ scapulæ. But, if the percussion is now quietly continued on the same spot some seconds, or even for minutes, till it happens that a percussion-stroke coincides with the moment in which the child again inspires deeply, and, for that purpose, has to abandon the abdominal pressure till the completion of the respiratory act, the original normal percussion-sound is suddenly heard again; it, however, lasts but a few moments, and is instantly succeeded by an empty, flat sound.

If the percussion has once disturbed the child, and especially if it does not cease to cry with the violent abdominal pressure, and so long as this pressure lasts, the phenomenon just described may be studied with the utmost advantage in any child under one year of age.

The proximate reason for this diminished sonorous sound upon the entire dorsal surface is owing to the abdominal pressure, whereby the whole contents of the abdomen are compressed upward. The difference between the right and left sounds, namely, the completely empty, flat percussion-sound on the right, is explainable by the strong upward pressure of the liver, the size of which is still disproportionately greater in comparison with the rest of the abdominal organs.

Upon the anterior surface of the thorax, and also on both sides, the changes in the percussion-sounds, originating from the action of the abdominal pressure, are also noticeable, but in a much less striking degree.

The singular phenomenon just described, namely, the complete dulness posteriorly toward the right side, causes my confidence to be somewhat shaken in the histories of pneumonia in small children that we find so frequently in text-books and journals; and the more so, as the dulness in those cases is always described to have been most intense posteriorly on the right side. Such physical investigations only can be relied upon in which it is expressly stated that, during the investigation, the child respired perfectly calmly and quietly; that it did not employ the abdominal pressure, and that the dulness detected then was also present during the inspiration, and could be distinctly discerned for several days. I am convinced that attacks of bronchitis, which in the first days of their existence are attended by some fever and dyspnœa, are regarded as cases of pneumonia in consequence of the observer's not being aware that the dulness which, under the circumstances described above, appeared on the right side posteriorly, *is a normal physiological condition;* this may also explain the successful treatment of and rapid recoveries from pneumonia.

There is another phenomenon to be noticed in percussing the thorax of a crying child, namely, the so-called metallic tinkling. This sound a person may study upon himself at any time, by striking the sternum with the shut fist, and at the same time singing loud notes. The tone is thus momentarily interrupted by a sound that has a metallic clang, and a pitch the same as the tone sung, which, directly after the blows have occurred, rings out in its original purity. This sound cannot be confounded with cavernous metallic tinkling, and the *bruit de pôt fêlé* occurring in the adult, as it can only be produced during crying or speaking, whereas that arising from cavities is heard even when the patient does not utter the least sound. Metallic tinkling is never met with in children who respire quietly, for, in the first place, cavities in children under two years of age, as is well known, are of extremely rare occurrence, and in the second, even if they do exist, this sound can only exceptionally be detected by percussion. No diagnostic importance can therefore be attributed to it.

The size of the thymus gland may be ascertained by percussion. If the manubrium sterni is carefully and slowly percussed as sharply as possible, a dulness will be detected, which decreases in circumference from month to month. By this examination the physician can frequently convince himself that many children have a large thymus gland, and yet never suffer from spasm of the glottis, and also that, in many children who suffer from violent spasm of the glottis (or what has been called asthma thymicum), a thymus gland cannot be found on percussion.

Auscultation, in adults the most important part of the physical examination, offers in children fewer advantages, partly on account of their constant restless condition and irregular breathing, partly owing to the smallness of space and the propagation of the sound, favored as it is by the elasticity of the thoracic walls, and lastly from the fact that the infantile voice can neither be called into action nor suppressed at the wish of the examiner.

In emaciated children, when the intercostal spaces present marked depressions, it is altogether impossible to adapt the stethoscope accurately, and hardly any child tolerates the auscultation of the anterior or lateral surfaces of its thorax with the naked ear, therefore it only remains for us to auscultate the back. But while in the adult we definitely know the space that is bounded by tracheal respiration, in children this is not the case. In healthy children we hear over the entire back, often even over the entire thorax, *a loud expiration and a tubular inspiration*, so that, although this condition, when met with in an adult, would make us unhesitatingly affirm an extensive consolidation of the pulmonary tissues, yet it would not in children. We have not in these auscultations both the strongly-defined sounds of normal vesicular respiration, and the bronchial respiration, but over the greater part of the thorax a sound very much like bronchial breathing, and difficult to distinguish from it. Thus the main conclusion which in the adult we are able to form from bronchial respiration, namely, solidification of pulmonary tissue, is lost; in children we have chiefly to depend upon a mere comparison of both thoracic moieties, upon which of the two it is most distinctly heard. Auscultation of the voice furnishes good cardinal points. The voice, it is true, consonates all over the infantile thorax, but where solidified pulmonary tissue exists, there it consonates so forcibly that the examiner believes he holds his ear against the mouth of the child, and that it cries directly into it. This sign is all the more valuable, as it is available in crying children, and therefore does not necessitate any particular care or loss of time in examining the child.

Palpation is the simplest and most convenient method of examining the infantile thorax. When the hand is laid upon the chest of a child, the temperature and moistness of the skin are immediately appreciated. Since thermometric measurement, owing to the restlessness of children, is not applicable, in private practice in particular, it is therefore necessary for the physician to become accustomed to judge of the temperature of the skin as accurately as possible by the hand alone, for augmented temperature is the most important of the group of symptoms which we call fever, and our therapeutic procedures in a great measure are conducted in accordance with it.

Besides the above general advantages, the hand that is laid upon the chest also feels the fremitus of the voice, i. e., the vibrations of the thorax communicated to the hand, which originate with the voice, and disappear again as soon as it ceases. These vibrations are most strongly felt at the spot where they originate, over the trachea and larynx, very distinctly along the spinal column, in the space between the scapulæ, plainly in the lateral regions, and over and above the clavicles and the sternum. Where the heart and liver are in direct contact with the chest, the fremitus is completely arrested. Layers of adipose tissue also weaken the vibrations.

Now, these phenomena occur in every healthy child, but become modified as soon as a part of the pulmonary tissue undergoes solidification by compact tubercles or scirrhous infiltration, lobar hepatization or carnification. When, in the above affections, the larger bronchi, terminating in the solidified parts, remain permeable, *the voice is felt much stronger than in health.* Occlusion of a bronchus abolishes all fremitus over a corresponding portion of the lung. Fluid effusions into the pleural sacs, where the liquid keeps the lung from the ribs, also hinder us from *feeling* the voice. On the other hand, in the compression of the lungs that necessarily results from that condition, the fremitus is much augmented over those parts of the thoracic walls against which the compressed lungs lie.

In addition to the voice, the rhonchi may also be elicited by palpation. If the tenacious masses of mucus which fill the trachea and bronchi in the form of lamellæ or trabeculæ are set in motion by the respiration, a certain sound is produced, which is carried along the thoracic walls farther and more distinctly than any other. On this latter circumstance is based the erroneous supposition that these sounds originate where they are most distinctly felt. The higher up toward the trachea the vibrating mucus is situated, the more diffused are the sounds produced thereby felt over the thorax; the smaller the calibre of the bronchus containing the mucus, consequently the nearer the periphery of the lung, the more circumscribed will the sound be on the thoracic walls.

Palpation of the voice and rhonchi should never be omitted, and in restless children must even take the place of percussion and auscultation.

These are the main points to which the physician has first to direct his attention in the sleeping or at least in the quiet child. Percussion should always be the last thing to perform, because by it the child is apt to be waked from its sleep.

The examination of the abdominal cavity is perhaps still more important than the examination of the thoracic, for in early life diseases of the intestines are by far more frequent than those of the lungs and heart. If, in the adult, percussion of the abdomen gives no reliable results, on account of the fluctuating gas in the gut, in the child, where this is of such frequent occurrence, it is of still less value. In all kinds of intestinal catarrh, the bowel is tympanitic, and distended, so that the liver and spleen, on percussion, appear to have perceptibly diminished in size.

Valleix, when he desires to examine the abdomen of a child, causes it to be brought suddenly to a bright window or near a light, on which the restlessness, as a rule, instantly ceases; the child is attracted by the light, and gazes at it steadily for some time. This moment must be made use of to make a slow, increasing pressure upon the abdomen, to which the child will calmly submit so long as the pressure causes no actual pain. In this manner the abdomen of the youngest child may frequently be pressed so firmly as to touch the spinal column. If the pressure is really painful, the child will utter an agonizing cry and distort its features, which sometimes directly ceases again as soon as the pressure has been removed.

Serous effusions into the peritoneal sac, which occur principally after scarlatina and in tuberculosis of the peritonæum, is difficult to detect in the supine position. The serum then sinks back into the posterior part of the cavity and the intestines float upon the top of the liquid against the abdominal walls, so that fluctuation can nowhere be discovered. But if the child be allowed to sit up or to lie upon the belly, the serum sinks downward and forward, and is then easy to be detected by percussion and by fluctuation.

The *anus* should be carefully inspected in every child. In every diarrhœa it becomes red, and forms a certain index of the severity and duration of the evil; on it also usually appear the first symptoms of congenital syphilis. The internal examination is not attended by any difficulties whatever; the little finger well oiled is readily introduced by a slow, rotatory motion, but this procedure always causes pain, and should only be performed when actual indications for it exist.

The *genitals* also deserve, in all cases, to be closely scrutinized. They are reddened in diarrhœa, and the scrotum especially excoriates very rapidly; and the female genitals secrete a larger quantity of mucus. The simplest manner of examining the urethra is by introducing a silver probe, bent like a catheter, for boys, which procedure is of service, as a remedy in many cases of strangury.

The *inner surfaces of the thighs* are the best indices for judging of the fleshiness of a sick child. An indisposition, and particularly a diarrhœa of several hours' duration, makes the formerly firm, tense integument soft and somewhat lax, in twenty-four hours small folds form in it, and, if the disease continues, the adipose substance disappears so completely that, in place of the former symmetrical condition, flabby folds form, which, however, as the nutrition improves, fill up again surprisingly quick, and the inner surfaces of the thighs once more display their former shape and solidity.

The examination of the mouth should never be omitted. By pressing slightly upon the chin the child will usually open the mouth, or a finger may be introduced and carried slowly backward between the cheek and gums, till it reaches the anterior border of the ascending ramus of the lower jaw; here the finger is insinuated between the upper and lower maxillæ, and now the mouth may be opened to the required extent. By a little adroitness and practice it is very easy to examine with the index-finger the posterior pharyngeal wall, the posterior nares, the epiglottis, and even the glottis itself; such an examination will often give much important information in certain cases of diphtheritis, retropharyngeal abscesses, croup, etc.

The tongue, in children, is even less "the mirror of the stomach" than in adults. Children with severe intestinal diseases very frequently have a perfectly normal red tongue, and conversely healthy children with a good appetite and regular digestion often exhibit a very white, or, at least, a tongue spotted with islands of white fur. Many parents so train their children from the earliest age, that they will put out the tongue whenever ordered, and accomplish some good by their obedience. The young ones, however, carry their good breeding so far, that they constantly put out their tongue, even upon the street, for the family physician, whom they often recognize at a distance, and to the general amusement of the passers-by. Teething children with swollen gums allow their mouths to be examined very unwillingly, it is therefore necessary to become accustomed to examine both jaws as rapidly as possible by one sweep of the finger, so that they may not thereby be irritated and disquieted.

Finally, there are two sounds which we have to note in the examination of children: the *cry* and the *cough*.

Children cry only during the expiratory act. During inspiration, it is true, some single sounds occur, for instance, in spasm of the glottis. But these loud, long-drawn inspirations are always single, and, properly speaking, cannot be included in the description of "cry," for by this we understand a succession of tones quickly following each other. The ordinary cry, therefore, takes place only during expiration; it is loud, ringing, long-drawn, and, in children of equal age, of tolerably equal pitch: still the tone of the cry has, in almost every child, something peculiar, which cannot be more accurately defined than the variations of the human voice. A momentary disturbance of the circulation must always ensue during crying, because the air in the lungs becomes compressed by the abdominal pressure, and can only escape slowly through the tense glottis, and not in comparison to the degree of its compression. After a deep inspiration, the child begins its cry by opening the mouth wide, when the tongue may sometimes be seen moving about in slight convulsions over the margins of the gums, the alæ nasi become dilated, the eyes tightly closed, and numerous wrinkles form upon the cheeks and forehead, the face growing constantly redder, its veins, as well as those of the neck, become turgid, and the cry is prolonged to the utmost without renewing the inspiration. When this period arrives, it rapidly takes a deep inspiration, and thus brings about a momentary remission of the distortion of the countenance. These distortions last as long as the child continues to be agitated; but, when it becomes pacified, the inspirations and expirations become uniform again, the wrinkles disappear from the face, a few slight short cries follow, the mouth gradually becomes closed, and a slight exhaustion follows, which generally terminates in a calm sleep. Sometimes, three or four cries, in rapid succession, in one expiration, are followed by one long-drawn cry, which terminates in quivering strains. This cry has a great similarity to the bleating of the goat. It may also be remarked here, that infants under three months of age (and to these only is the preceding description applicable) never shed tears.

The most important conclusions, as to the nature of the disease, to be drawn from the cry, are the following: children who suffer from pneumonia, pleuritis, or atelectasis of the lungs, *never cry loud, or continuously;* they can only emit a low, painful moan. Children afflicted with catarrhal, diphtheritic, or croupous laryngitis, are unable to cry at all, they are aphonic; the milder degrees of catarrhal inflammation of the larynx do not completely suppress the cry, but make it hoarse. Hydrocephalic children utter only shrill tones, and after each outcry relapse into their former drowsiness. A child ill with fever never cries continuously nor long, even when it suffers violent pains. Children suffering from otitis, deep abscesses, or when wounded, cry the longest and most violently.

In the *cough* we have a very important index by which to judge of the state of the respiratory organs. If the child coughs loosely, loud, and without pain, it is very certain that we have only a simple bronchial catarrh to deal with; if, however, it distorts the countenance when provoked to cough, if the cough is dry and low, and if it seeks to suppress it as much as possible, then it is equally as certain that we have to deal with an inflammatory affection of the lungs. Croup begins with a dry, barking cough, which but too soon gives place to a low aphonic sound. Pertussis consists of a long, spasmodic, jerking cough, interrupted by a protracted, loud, and sucking inspiration. Tuberculous children, in most instances, have a dry cough, which recurs at short intervals day and night. The cough of typhous patients is, in comparison with the great morbid alterations which we physically demonstrate on the lungs and frequently find after death, very insignificant and without severity.

These are the principal peculiarities which the physician has to take into consideration in the examination of a sick child. Now, as regards the conduct of the physician, the utmost patience and gentleness are indispensable in his intercourse with children. Those from one to three years old are always the most difficult to manage. Nurslings and children under one year are seldom very timid, and are easily quieted by some diverting noise. But older children often have an insurmountable shyness for every strange face. Such a child the physician must not approach immediately after entering the room; he should at first ignore the child's presence altogether; should enter into a conversation with the parents or nurse, in a gentle voice, and finally gradually approach the child with some bright object, or with a piece of sugar. When at the bedside, the child should not be immediately uncovered, its abdomen felt and squeezed, and the physical examination instituted. Some questions suitable to its age are first put to it, its playthings are admired, or it is told of some new ones, and promised to be presented with them, etc., etc.; in short, it is necessary to be on friendly terms with the child before the undertaking of a regular, thorough examination can be thought of. In this manner, however, it is almost always possible to quickly gain the friendship of the child. If, with a friendship formed in this manner, a little seriousness and energy are allowed to be blended, much more authority will thereby be acquired in a moment over the child than the parents ever thought possible. Children, under such authority, allow themselves very quietly to be examined, readily lie down upon any side desired, take even the bitterest medicines without objection, and assist the medical examination in every manner possible. *Never, and under no circumstances, should the attempt be made* to bring an unruly child into obedience by harshness, by firmly holding it, and still less even by a slight blow. Such measures not only cause greater fear, and give rise to violent crying, but the physician will thereby only bring upon himself the aversion and even hatred of most narrow-minded parents—the class that usually have boorish and unmanageable children. On the other hand, if the physician in such instances retains his equanimity and mild voice, the parents will feel most disgraced by the ill-breeding of their children. They then sometimes punish the child so severely that the physician, from a medical point of view, has to interfere, and then he will have gained an humble and submissive patient. In general, the principle will hold good that the more seriously sick the child is, all the more easily will it permit itself to be examined.

To the commencing practitioner, inexperienced in the Pædiatria, these observations may appear insignificant and unimportant, but, when he has once conducted himself in accordance with them, he will perceive that without these details a successful treatment would be clearly impossible, notwithstanding all his knowledge and skill in the methods of examination.

CHAPTER III.

NURSING AND CARE OF CHILDREN.

The best nutriment for a new-born child is undoubtedly the milk of its own mother; if she cannot nurse, the milk of a wet-nurse; and, if this is also unattainable, the milk of a domestic animal.

In regard to the suckling of a child by its own mother, two adverse conditions are not infrequently met with, viz.: an *inability* of the mother to nurse; and the existence of circumstances rendering it improper for her to do so.

She *cannot* suckle, when she has insufficient or no milk, when the nipples are wanting or are malformed, or when local diseases of the breast, abscesses or carcinomatous nodules, exist. Whether a mother will have milk and be able to suckle her child, is, in primiparæ, difficult to prognosticate. The size and firmness of a breast form no positive guide for that. Often young, healthy women, with well-formed and apparently physiological breasts, have no milk, while in feeble women, with previously flat bosoms, it is often secreted plentifully, contrary to expectation. Pregnant women, from whose breasts much colostrum flows, will be best able to suckle the coming child. In regard to this secretion, *Donné* divides pregnant women into three classes: to the first belong those who have so little colostrum that at the end of pregnancy it is only possible to squeeze out a few drops from the glands. This colostrum microscopically contains only a few milk-globules, and only a small number of colostrum-corpuscles. A small quantity of milk-secretion should, then, only be calculated upon after the confinement.

The second class comprises those women who, it is true, secrete much colostrum, which, however, has the very same properties as that of the first class. It is just as poor in milk-globules and colostrum-corpuscles, and a plentifully-secreted, though thin, but non-nutritious milk may, with probability, be expected after delivery.

But if, in the third class, the secretion of the colostrum at the end of gestation is rich, milk-white, and mixed with yellow streaks and lumps, and many milk-globules, and colostrum-corpuscles are present, then we may prognosticate, with tolerable certainty, that the pregnant one is destined to suckle her child, and will secrete sufficient nutritious milk.

Total absence of the nipples is seldom met with; frequently, however, a depressed nipple is observed, for which usually a too high corset, in which the space for the chest is too small, is to blame. After delivery it is too late to improve these depressed nipples, and the child will uselessly tire itself out in the attempt at extracting the milk, and finally ceases altogether; much, however, may be done for this condition during the last months of pregnancy. The women should be made to wear very loose garments, and once every day should put the bowl of a clay pipe over the nipple, and suck with the mouth at its stem, or, still better, the caoutchouc breast-pump may be employed. *Bouchut* suggests, if the woman cannot tolerate this manipulation, for another person to use the lips in the same manner as the nurse often draws the breast of the parturient woman.

Lastly, those benign, hard nodules, which occur so frequently in girls and young married women, but which are perfectly painless, should not be confounded with carcinoma of the breast. They are totally harmless, and disappear completely in the first few weeks after parturition, soon after the nursing is in operation.

The second condition, i. e., circumstances rendering it improper for the mother to nurse her child, is much more difficult to explain. Feebly and tenderly-organized women, at times, bear the suckling very well, when they otherwise possess favorable external circumstances and the lacteal secretory function so necessary for suckling. In other cases, on the contrary, nursing acts upon strong, robust women, when poverty, anger, grief, or unhappy matrimonial circumstances, become added thereto, extremely unfavorably; they become emaciated and grow old remarkably early. Those mothers must absolutely be forbidden to suckle their children, who suffer from arthritis, epilepsy, syphilis, chronic cutaneous diseases, and tuberculosis, or even if they have only an hereditary disposition to them. In hysterical women, wet-nursing has, by virtue of the extraction of the vital fluids, not only an injurious influence upon the health of the mother, on account of the influence of the nervous system on the secretion of the milk, but also upon the child. When the mother is at an advanced age, especially if she is a primipara, wet-nursing is of itself forbidden, by the want of milk; at any rate, it is in all cases to be dissuaded from on account of the thinness or poverty of the milk. Acute diseases, exanthema, typhus, puerperal fever, etc., usually cause stoppage of the milk; as long, however, as it is secreted, the child should not be weaned. Such milk does not act injuriously upon the child, and its abstraction is, in all instances, very advantageous to the mother.

When none of these evil conditions exist, it should be made every mother's sacred duty to suckle her own child. Frail constitution and smallness of stature cannot remove this obligation; otherwise most of our city women would be exempt from it. Aside from all other circumstances, the milk of its own mother always agrees best with the child, for it is an often-observed fact that the child of a feeble mother will prosper at the maternal breast and grow excellently, while a strange child, whose guardians had been misled by the good appearance of the first, which had been given this feeble mother for a wet-nurse, would thrive under no circumstances.

If a mother cannot or will not suckle her own child, then a wet-nurse is always the best substitute.

It is very difficult to prescribe general rules for the selection of a wet-nurse, because a number of local circumstances come into consideration here, which must, naturally, differ in different cities and countries.

If the selection can be made from a number of women, who offer themselves for the situation of a wet-nurse, that one should always receive the preference which has given birth to, and at her own breast brought up, a robust, healthy child. If this can be confirmed by personal or creditable evidence, we have the greatest guarantee that after the expected deliveries the nursing will proceed with equal regularity. It is always well to procure a wet-nurse who has been confined three or four weeks before the woman whose child she is to suckle, for in the first three weeks almost every parturient woman has a tolerable quantity of milk to display; but, in many, the milk, after this period, decreases from day to day, and thus, in case it is necessary to engage a wet-nurse who has only been confined a few days before, we may be compelled, in a few weeks, to discharge this expensive individual, on account of insufficient milk. Moreover, the sequelæ of parturition, and particularly those annoying and tedious abrasions of the nipples are no more to be apprehended in a woman who has already nursed several weeks. The advantages enumerated here, at any rate, outweigh the slight disadvantage that the milk of such a wet-nurse, by rights, belongs to a child that is several weeks old. On the whole, the chemical composition of the milk in one and the same wet-nurse, and still more in different ones, is so changeable that it is merely a fortunate coincidence when the milk of a strange woman agrees as well with a child as that of its own mother.

The best age for a wet-nurse is between twenty and thirty years; still, many exceptions may be made to this rule; girls under twenty years are mostly primiparæ, and therefore as yet do not possess the necessary qualifications for wet-nurses. In persons who are more than thirty years of age, the metamorphosis of materials no longer takes place with sufficient activity, such as is requisite to produce milk that is satisfactory in quality and quantity. The French physicians maintain that brunettes have a more nutritious milk than the blondes, of which, in Germany, I have not yet been able to convince myself. As regards the mammary glands, it is necessary that they should be of moderate size, should be covered with healthy integument; the nipples should be two or three lines prominent, and on pressure of the mammæ the milk should flow from the lacteal ducts in numerous fine streams. Formerly it was also insisted upon that the wet-nurse should have good teeth; but this, on account of caries of the teeth having become so general, now seems to be entirely neglected. It seems to me much more important, however, that she should have healthy, firm, red gums. Pale, bluish, easily-bleeding or foul-smelling gums always give rise to a suspicion of poverty of the blood, or difficult digestion, two conditions which in no way harmonize with wet-nursing. Among our people, the phlegmatic and submissive wet-nurses are the most desirable; an imperious person can never serve as a wet-nurse in a house where several servants are employed; for she is barely engaged before she makes them feel her unbearableness, and after several days seeks to drive them from the house. The *finale* of the whole scene is, that the peace-disturber is discharged, and the family physician, who is expected to have an expedient for every thing, has to procure another wet-nurse. Generally, country girls are preferred to those from the city. If it were true that the morality in the country is greater than in the city, then this would no doubt be an important reason; my experience, however, does not confirm these suppositions. In most country wet-nurses the additional evils often exist that they become seriously home-sick, cannot tolerate the city board and manner of living, and with difficulty become acclimatized, so that, notwithstanding their stronger formation and their more developed breasts, they render less service than a factory-girl or a city servant-maid.

Before a wet-nurse is engaged she and her child must submit themselves to an examination of their entire bodies; the child must be well nourished, should be sufficiently fat for its age, and on no parts of its body should have the least suspicious-looking sore. The nurse should have the above-described qualifications of the breasts and gums; the physical examination of the thoracic cavity should reveal no abnormities; she should be free from all kinds of ulcers, and the mouth, anus, and genitals, in particular, should be carefully examined for traces of syphilis.

All these precepts only find their applicability when a selection can be made from several wet-nurses. When, however, as is frequently the case in small places, a person must be content when he is able to find one in the whole vicinity that offers herself for that situation,. any one may then be taken that is free from febrile diseases and syphilis, and suffers from no demonstrable tuberculosis, secretes a sufficient quantity of milk, and has healthy nipples.

We now come to the important point, i. e., the milk and its chemical and microscopical qualifications.

The specific gravity of human milk averages 1.032. If it is allowed to stand quietly for some time, a thick, rich in fat, yellowish-white stratum, the so-called cream, will form on its upper surface, while the fluid found beneath it, poorer in fat and therefore specifically heavier, has a bluish-white color. Fresh woman's milk is bluish white or pure white, has a feebly sweetish taste and alkaline reaction; but, when it is allowed to stand in a temperature not too low, it gradually becomes *neutral*, and finally reacts acid and forms in small lumps.

The essential difference between woman's milk and cow's milk does not consist in the differences of the quantities of the milk-sugar and of the butter, but in this: *that the casein of cow's milk, when it turns sour, curdles into large lumps, and even into a solid gelatinous mass; whereas the casein of woman's milk always coagulates into small lumps and loose flakes.*

In the microscopic examination, fresh human milk presents itself as a clear liquid, in which, as in an emulsion, fat globules, which have been called milk-globules, are suspended. Milk-globules vary in size, most of them having a diameter of 0.0012—0.0020‴, but if the milk is agitated a little, allowed to stand for several hours and then examined from the upper layer, along with the ordinary milk-globules, many large oil-globules will be found, the diameters of which increase to 0.03 or 0.04‴. (See Pl. II., Fig. 3.)

By the microscope alone, without the aid of chemical reagents, it is not possible for one to convince himself that the milk-globules have proper enveloping membranes. However, the presence of an enveloping membrane may be easily demonstrated, and, in fact, in two different ways. The one method, that of *Henle*, consists in the application of diluted acetic acid, and observing the acidulated milk under the microscope. The milk-globules in consequence undergo such an alteration, that, if they were only minute oil-drops, they would never be capable of manifesting. They become very much distorted, some caudated, others biscuit-shaped; on most, however, a minute drop becomes visible, which appears almost like a granule of the milk-globule; to this minute drop new ones become added on some places, so that around the now diminished milk-globule an entire circle of fine drops occasionally forms. By the application of concentrated acetic acid, the milk-globules fuse together into large drops. The second method is that of *E. Mitscherlich*, and consists in this: when fresh milk is agitated with ether, the milk remains unaltered, and the ether takes up only a small quantity of the fat. Were the milk a simple emulsion, it would surrender all its oil to the ether, and would itself be converted into a transparent, or at least a semitransparent liquid; if some substance is now added which possesses the power of dissolving the enveloping membrane, for example, caustic potash, or carbonate of the same, the ether then takes up all the oil, and an almost transparent liquid whey remains behind.

Besides the milk-globules, other elementary substances occur in the milk, namely, colostrum-corpuscles or *corps granuleux* of the French. Physiologically they are only found in the first few weeks after the

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delivery; they then diminish rapidly, and always reappear as soon as any sickness supervenes upon the confinement, or the nursing-woman is attacked by an acute febrile affection. They consist of irregular, conglomerated, very small oil-globules, held together by an amorphous, slightly-granular substance, and, according to *Henle*, are of 0.006‴ to 0.023‴ in diameter. Ether dissolves these much more readily than those of the milk-globules; acetic acid and caustic potash dissolve the granular intermediate substance, and disperse the oil-globules; iodine-water dyes the colostrum-corpuscles intensely yellow. There is, therefore, no doubt of these corpuscles being very small oil-globules embedded in an albuminous substance; a granule and an enveloping membrane cannot be demonstrated. (See Pl. II., Fig. 4.)

Along with these principal elementary substances of the milk, some solitary *epithelium-cells* and *mucous corpuscles* are also found in it; they only occur in larger quantities in local affections of the mammary gland.

Coagulable fibrine occurs only in milk containing blood.

Blood-corpuscles are seldom found in the milk, and ordinarily mingle with it only when erosions of the nipples exist. Fungi and infusoria are never found in fresh human milk.

As regards the chemical composition we have here: (1), *sugar of milk* ($C_{12}H_{12}O_{12}$), which in human milk is found from 3.2 to 6.2 per cent. Colostrum contains most of the milk-sugar (7 per cent.); its quantity, according to *Simon's* investigations, diminishes from month to month; it seldom, however, falls below 4 per cent.

(2.) *Fat, Butter.*—Butter forms the contents of the milk-globules, and may be tolerably well isolated by destroying the enveloping membrane (by churning). The individual fats of woman's milk have not yet been subjected to accurate analysis, but this much is known—that they very quickly become rancid and form volatile oleic acids. The amount of fat in human milk is not constant. *Simon* found from 2.53 up to 3.88 per cent. of butter; *Clemon* and *Scherer* on the fourth day after the delivery found 4.3 per cent., on the ninth 3.5 per cent., and on the twelfth 3.3 per cent.; *Chevalier* and *Henry* 3.5 per cent. In the colostrum *Simon* found 5.0 per cent. of butter. It is a remarkable fact that, by milking or artificial sucking, the milk that exudes last always contains more fat than that which has flowed out first, the other elements remaining unaltered. As this observation was first made in cows, it was supposed that the milk commenced to separate itself already in the fodder, so that the watery portion was greatest in the teats and less in quantity higher up; but, as *Reiset* also observed the same phenomenon in woman's milk, which at various intervals was extracted from the breast of a wet-nurse, the reason has therefore to be sought in some other cause than in the presumed mechanical circumstance, since simple explanation of dependence by virtue of the position of the breasts cannot be entertained.

According to my latest researches, the quantity of fat in woman's milk varies extraordinarily. I have succeeded in producing an extremely simple optical milk-test, with which an accurate estimation of the amount of cream can be made in two or three minutes, and indeed with a very small quantity of milk. A detailed description of the instrument and the applications that have hitherto been made of it, is to be found in an appropriate *brochure*, "A New Milk Test," F. Encke, 1862. In this manner the quantity of fat can be surely ascertained, and, what is of still more importance, with merely a couple of cubic centimeters of milk. The method hitherto employed for ascertaining the quantity of fat in human milk consisted in filling a galactometer, graduated by a scale of one hundred lines, with the milk pumped out from the breast, up to the 0 line, allowing it to stand quietly for twenty-four hours, and then to read off the thickness of the stratum of cream. Good woman's milk must show no less than three lines thickness of cream. This galactometer, however, has the disadvantages that the investigation can only be completed after twenty-four hours, and that it is often difficult and painful to pump out so large a quantity of milk from a wet-nurse's breast. With my optical milk-test both of these disadvantages are avoided.

Sugar of milk and butter contain no nitrogen, and are the so-called respiratory material of woman's milk.

(3.) *Casein* is found liquid in woman's milk, so long as it does not react acid; it becomes separated into light flakes as soon as a superabundant amount of lactic acid has formed through the decomposition of the milk-sugar. The milk of a good wet-nurse should contain 3 to 3.5 per cent. casein; the colostrum, however, contains a little more, nearly 4 per cent. It is very difficult and requires a long time to ascertain the chemical quantity of the casein, and therefore it may be appropriately omitted in the selection of a wet-nurse. Casein is the only nitrogenous substance found in the milk.

(4.) The soluble salts of human milk are chloride of sodium, chlorate of potassa, and alkaline phosphates, and in addition to these also potassium and sodium, which are found combined with the casein.

The insoluble salts are the phosphates of lime and of magnesia, which especially belong to the casein, and traces of oxide of iron and of fluor. 0.16 to 0.25 per cent. of salts, on an average, are found in human milk; 0.04 to 0.09 per cent. of which are soluble. The quantity of salts in the colostrum is greater than in woman's milk at a later stage of lactation.

Vernois and *Becquerel* examined the milk of eighty-nine nursing-women, and furnish us with the following average numbers:

Density	1032
1,000 parts of milk contain:	
Water	889.08
Sugar	43.64
Casein	39.24
Butter	26.66
Salts	1.38

There are certain circumstances which possess a marked influence over the synthesis of the physiological milk, namely: 1, innervation; 2, the time that has elapsed since the confinement; 3, the manner of dieting the wet-nurse; and 4, the sexual functions.

(1.) *Innervation.*—The injurious influence which anger, fright, pain, nervous attacks, etc., are apt to exercise upon the milk, has been long known. The chemical changes which take place here have been less accurately investigated. In this respect the mammary gland resembles the lachrymal gland, which participates in almost every mental excitement. It is a fact that those children who drink at the breast of a wet-nurse who is mentally excited, soon after begin to cry violently, suffer from colic, get diarrhœa, and are sometimes attacked by convulsions. Whether the milk can thereby become so poisonous that children after partaking of it will die, must be doubted. When we bear in mind that a disproportionately large number of children, on the one hand, in general die suddenly, and, on the other hand, that there are nurses who almost daily become angry, we would therefore be more inclined to believe in an accidental concomitance than in an actual poisonous milk. I once had an hysterical woman under treatment, who suckled her child, and was not a little surprised, when, after one of her hysterical attacks, I pumped out a couple of teaspoonfuls of milk from her breasts, to find this milk almost totally transparent, like whey, and devoid of all saccharine taste. For the whole of that day she did not allow the child to drink at her breasts; and, twenty-four hours after, the usual, very thick, yellowish-white milk, rich in fat, was again present, on which the child throve amazingly. It is also well known that cows give much less milk than usual when they are milked by strange persons. It is even said that they sometimes will give no milk at all when they are irritated during the milking, or annoyed by the presence of strangers. This must be due to a sudden diminution of the secretion and partial reabsorption of the secreted milk; for the milk cannot be voluntarily retained, since no muscular apparatus answering to that purpose exists. At any rate, it is evident enough from these statements that great attention must be bestowed upon the psychical disposition of the wet-nurse, and that there are perfectly healthy, well-developed women who, nevertheless, are totally useless as wet-nurses.

(2.) *The time that has elapsed since the confinement* has a great influence upon the composition of the milk. The colostrum, or the first milk, in addition to the already-mentioned chemical bodies, contains also albumen, mucus, and large granular colostrum-corpuscles. The size of the milk-globules is still more unequal than is the case later on. Butter and salts are found in larger quantities than at a later period, and to this is due the slightly laxative effect of the colostrum. The milk-sugar decreases in quantity from month to month, and finally remains at 4 pr. c. as a minimum.

(3.) *The articles of food of the wet-nurse*, when they are insufficient, materially diminish the quantity of the milk in general, and the solid component parts in particular, so that a hungering wet-nurse supplies but little and watery milk of a light specific gravity. Butter and casein diminish in the highest degree.

Vernois and *Becquerel* have made numerous experiments in this direction, and found the following numerical differences:

	In good nutrition.	In average nutrition.
Specific gravity	1,034.68	1,031.91
Water	883.86	891.80
Solid component parts	111.14	108.20
Sugar	42.97	43.88
Butter	26.88	25.92
Casein	39.96	36.88
Salts	1.33	1.52

It is difficult to decide whether individual articles of food make more milk than others, and, in this respect, no general rules can be established, because the assimilation of the various articles of food varies extremely in different individuals. This much, however, is certain, that the quality and quantity of the milk are not in exact relation to the amount of nitrogen contained in the food. A wet-nurse from the country, for instance, will give more and better milk when fed upon the coarsest meal and milk-diet than if she consumed the largest piece of roast-beef every day. The use of alcohol or alcoholic drinks imparts to the milk a stupefying qualification. The nurslings sleep much, are soon affected with cerebral irritation, digest badly, and become emaciated. In countries where beer is a popular drink, the women consider it impossible for them to suckle without consuming two or three mugs of beer daily. Those that were habituated to large quantities of beer in the unimpregnated condition, may continue to partake of it during lactation; they will produce by it no injurious effects upon themselves nor upon the child. But when wet-nurses first learn to drink beer during lactation, and strive now with all their powers to consume a large quantity of it at one time, marked cerebral congestion and digestive disturbances are induced thereby, which, at any rate, have injurious effects upon the nursling.

Many remedies, which have been administered by the mouth, were subsequently detected in the milk. Most of the salts soluble in water, if they have not produced a profuse diarrhœa, are found in the milk again ; iodide of potassium may be most easily and decisively demonstrated. The milk is agitated with a little starch-flour, and a few drops of nitric acid are added to the mixture, when the starch will instantly become converted into the well-known dark-brown iodine paste. Various coloring substances also pass over into the milk. In the milk of cows, fed with esparsette, a blue coloring matter forms, which is said to possess analogous properties to indigo.

Absinthium (wermuth) makes the milk bitter, the ethereal oils of *garlic* and of the *thymiæ* taint it with the odor of these vegetables. When a drastic purgative of any kind is administered to the wet-nurse, its effects, in most cases, will become apparent in the milk, and, through it, upon the child. The treatment of the nursling, by remedies administered to the mother, is, on the whole, a useless torture to the latter; when similar remedies are actually indicated, the child will surely be found to tolerate them just as well when they are administered to it in properly-divided doses directly from the medicine-glass, as when they have first been taken up by the circulation of the mother, and then secreted by the mammary glands in very small and certainly in not accurately definable quantities.

(4.) *The sexual functions* have an undoubted influence upon the secretion of the milk. If the wet-nurse menstruates, her milk in general will be sparsely secreted, but its solid component parts do not decrease in quantity; on the contrary, they become augmented. Butter and casein increase decidedly, milk-sugar and the salts demonstrably. The child thereby becomes somewhat restless, and displays the signs of disturbed digestion. But, after the termination of the menstruation, the former composition and quantity of the milk return, and for this reason it does not seem proper to immediately discharge a menstruating wet-nurse, as is so very frequently done; it is much more advisable to wait for the recurrence of the catamenia, and then only to discharge the nurse when the child remains indisposed for some time after the menstruation, and does not thrive in the same manner as before.

If pregnancy recurs, the continuance of lactation is of itself prohibited, because the secretion of the milk immediately becomes very much diminished, and the milk again assumes the properties of colostrum. If, in exceptional cases, these changes do not take place, the nursling must nevertheless be weaned, because, otherwise, the growth of the fœtus will be interfered with in the highest degree. Whether a coitus, upon which no gestation follows, is in itself injurious, I am unable to say; it does not seem possible, however.

Rapidly-recurring pregnancies exercise an injurious influence upon the secretion of the milk. On account of the anæmic and general hyperæsthesia of the women which originates therefrom, but little and insufficiently-nourishing milk is generated.

The milk, through certain diseases, undergoes important changes. Generally, in the milk of wet-nurses suffering from febrile affections, larger quantities of colostrum-corpuscles are found. Its quantity thereby decreases vastly in amount, or it dries up altogether. The solid component parts, however, do not disappear with equal rapidity with the watery, so that, at the invasion of a febrile disease, a milk, *very rich* in solids, is generated, and for that reason indigestions are very easily induced in the nursling. In general, the rule may be established, that the nursling should be left at the breast of the wet-nurse so long as she has milk, and the child suffers no very great digestive disturbances; it is, however, necessary to premise that the disease must be not of a contagious character—nor an acute exanthema, nor petechial typhus, nor syphilitic affection.

For the practical physician, it is entirely sufficient to prove the following properties of the milk: (1.) He fills his graduated galactometer with milk, and allows it to stand quietly covered for twenty-four hours, at the expiration of which time the stratum of cream should comprise at least three lines of the glass in thickness. (2.) He tests the milk with blue litmus and yellow turmeric paper. The litmus-paper should in no case become red; the turmeric-paper should turn slightly brown. (3.) He puts a few drops of the fresh milk upon the tongue. It should have an insipid and slightly-sweetish taste. (4.) He puts one drop of the milk under the microscope. If the wet-nurse has been confined for more than eight days previously, the colostrum-corpuscles and epithelium-cells should not be present at all, or only in very small numbers. The milk-globules ought not to be of too unequal sizes, nor be present in large quantities.

In general, it may be remarked that the state of health of the wet-nurse, her digestion, her sleep, her respiration, her skin, and her genitals, deserve a much greater attention than the chemical and morphological composition of the milk, and that it is more important for the physician to satisfy himself accurately of a sufficient quantity of milk than to prove the qualitative proportions. The quantity of a milk-secretion may be ascertained by weighing the child both before and after nursing, by which it should always be found to have increased from three to five ounces. But, as these weighings are troublesome, and not very much liked in private practice, simply watching the child while it nurses will serve to inform us whether the nurse has sufficient milk or not. If the child does not exert itself very much at it; if the milk runs out at the angles of the mouth; and if, after half an hour, it quietly and contentedly forsakes the breast, one may be convinced that it has obtained a sufficient quantity of milk.

If, now, one has had the rare luck to find a wet-nurse answering in every respect, the following precautions are to be taken to preserve her future good health. Warm baths are, for persons from the lower ranks of society, something so rare and unusual, that it does not seem advisable to allow the wet-nurse to take whole baths at once; it is best to have her take several parts of baths in the week; warm water, with soap and good-will, will accomplish a tolerable degree of cleanliness. If the wet-nurse has been used to warm-water baths before, they will also be harmless to her during lactation. The same holds good with river and cold sea baths. The rule should always be adhered to, not to alter the habits and manner of living of the wet-nurse, if it is only possible to carry them out in conjunction with a sensible house *régime*. The wet-nurse may partake of *every thing*, with the exception of highly-spiced and very salty food and alcoholic drinks, that is palatable to her; and it is always best, if her manner of living, a couple of between-meals excepted, does not deviate from those of the family in which she has come to live. All her dishes must be well prepared and suitable to her taste; for the rest, it is really superfluous to ordain a detailed bill-of-fare.

Her sleeping-room should be well ventilated, and she herself must, without regard to the weather, take daily exercise in the fresh air; it is only necessary to observe here, that, if she is not well and long known, she should never be allowed to go out alone.

A great prejudice exists in the public mind against menstruating wet-nurses, and a few spots of blood upon their linen suffice to cause the parents of the nursling the greatest anxiety. The danger, however, is not so great by far as it appears; most wet-nurses menstruate but feebly and irregularly, and although during the catamenial flow they have usually somewhat less milk, and although the children at this time, it is true, may be seized with colic pains, yet, in from one to three days, the whole process is over, and wet-nurse and nursling again enjoy the best of health.

Two principles must be maintained and daily inculcated:

(1.) The breast is no quieting remedy for the crying child, but it is only to be given to it regularly every two or three hours. Any restlessness that occurs during these intervals is no sign that the child is hungry, but will be found to be due to some other cause; frequently to tight dressing, wet diapers, or the like. In the night a four hours' pause, for instance, from nine in the evening to one in the morning, suffices completely to allow the wet-nurse to enjoy the first half of the night's rest. The advice of some Pædiatricars, not to put the child to the nurse's breast from evening till morning, I have not yet been able to carry out.

(2.) The wet-nurse should never be allowed to keep the child with her in bed. I am convinced that many of the mysterious sudden deaths of nurslings are to be explained by suffocation in the bed of the mother or wet-nurse. The nurses fall asleep while suckling the child, and either suffocate it by themselves or by the bedclothes falling upon it. A cautious mother should, therefore, never begrudge herself the trouble to look after the wet-nurse several times a night and insist with the utmost firmness upon the latter's carrying out this rule.

Many wet-nurses suffer from obstinate constipation, and, by hiding the evil, ultimately bring upon themselves actual digestive disturbances. They should therefore be instructed not to neglect it, but immediately to inform the parents of the child of it; the cure is very simple, for the entire trouble may be removed by a few drachms of conf. sennæ or boiled prunes.

The wet-nurse ought to be treated with sympathy, and in a friendly manner; the poor creatures are heartily to be pitied, notwithstanding their high wages, who, by their own fault, it is true, get so far as to give away their own child, and in its place take a stranger's to their breast; such a service, if regarded in its true light, cannot be paid with money.

Finally, the question arises, When and how should the child be weaned?

The answer for this question but rarely depends upon the opinion of the physician alone; usually a number of external causes, or regard for the health of the wet-nurse or of the child, influence the determination of the period for weaning. Here, too, as unfortunately in so many other things in the practice of medicine, the affair cannot be disposed of with a few *numbers;* many circumstances must be placed opposite each other, and carefully weighed. The most natural is manifest, to allow the child to nurse so long as it readily takes the breast, thrives upon it, and the wet-nurse does not suffer therefrom the least prejudicial effects in her health, such as weakness, pallor, emaciation, hyperæsthesia, etc. This condition in a healthy nurse and a strong child lasts, in our climate, on an average, from four to eight months. Then the nurse perceives that the secretion of milk does not increase in comparison to the increasing growth of the appetite of the child, and consequently the nursling does not obtain sufficient nutriment. Now the period has arrived when the child may be allowed other nutriments besides the breast. Here, too, it is difficult to say whether this or that article of food is the most appropriate, and the rest injurious, for all children have not the same power of digestion and the same taste; some, for instance, will take no cow's milk, nor any thing prepared with it, so long as they get the breast, if it is only once a day, while they will take the various beef-broths without much objection; others will take no meal-porridge, but only cracker-soup; while still others will partake of no kind of milk preparations, but only of beef-broths, etc., etc. I therefore cause the commencement to be made with a thin fresh bread-and-milk preparation; if in eight days this does not succeed, I try meal-porridge; and if this is also unacceptable, then I resort to thin beef-broth and bread. Some one of these three preparations will be tolerated by every child if the breast of the wet-nurse is incapable of supplying sufficient nutriment. For four weeks the child gets one mess a day; for four weeks more, two; and for four weeks more, three times daily. In the mean time the child has learned to masticate the crust of white bread and to drink water, takes the breast but once during the night, and does not miss it very much when finally at night it gets lukewarm cow's milk in its stead.

This is the surest and safest method of weaning a child. Often enough it has to lose the wet-nurse at once, or in a very short time. In that case it is especially important to take into consideration the dentition periods. If the child has happily just passed through a dentition period, so that it may be assumed with certainty that it will be free from the troubles of dentition during the coming weeks, then, in most cases, it will also bear the sudden weaning without any danger; but, on the other hand, a profuse diarrhœa comes on in most cases, which often cannot be arrested, or from the effects of which, at least, children suffer for months. As soon as a child has cut its upper and lower incisor teeth, Nature has assigned to it more solid food than the milk of its mother. At any rate, it is useless, and, for most mothers injurious, to suckle their children beyond the first year. In most instances they then wean themselves, because they do not obtain a sufficient quantity of milk from the breast at one time. I once treated an American lady, who still suckled her son who was *two and a half years old*, till one morning, when the strongly-developed, robust child was called to be nursed, he very kindly replied: "I thank you, dear mamma, the nursing is too tedious for me!"

If the mother herself is unable to suckle, and has not the means wherewith to hire a wet-nurse, there is no other alternative than to try *artificial feeding.*

The following conditions are requisite for an artificial rearing. Care in the selection and preparation of the nutriments, great patience and perseverance, the strictest accuracy, manual dexterity, and the highest degree of cleanliness.

The best substitute for woman's milk is cow's milk, not because it resembles it most in composition, but because it can be obtained most regularly and easily at a low price. Those only who have devoted some time to the quantitative examination of milk will be able to agree with me that the few per cents. more of casein and butter, and the few per cents. less of milk-sugar alone, cannot make the great difference which certainly exists between the nourishing of a child with woman's milk and cow's milk. Indeed, the secretion of the mammary glands, like that of the kidneys, has tolerably wide physiological boundaries, out of which some really fine medium numbers may be constructed. But, nevertheless, it does not follow from these averages that that milk is the best which stands nearest to the physiological average.

The important difference between woman's and cow's milk is, as already observed above, to be found in this, that the casein of woman's milk curdles in the stomach into small light flakes, forming a very loose jelly, while that of cow's milk coagulates into large, compact lumps, of which one may convince himself by causing a child brought up at the breast, and one artificially reared, to vomit a quarter or half an hour after the meal. This is easily accomplished by rapidly moving the child about, by frictions over its gastric region, etc. The loose flakes of the woman's milk are easily digested and assimilated; the firm lumps of casein of the cow's milk, the infantile gastric juice is incapable of dissolving, they are thrown up again or wander through the whole intestinal canal as large, sour, undigested masses, irritating it in its entire length. Hence it all depends upon our ability of depriving the casein of cow's milk of this property, and that in a great measure may be accomplished by rendering it slightly more alkaline. For this purpose I have been in the habit of using for some time back a solution of carbonate of soda (ʒ j to water ℥ vj), a teaspoonful of which is added to the milk at every meal. When the milk is boiled into a mess or porridge, I cause the solution to be added to the cold milk, and in summer the entire quantity of milk to be consumed in the twenty-four hours should be rendered alkaline immediately upon its arrival at the house, by adding a tablespoonful of the solution to every five ounces of milk. For very young children I cause, in addition, one-third of water and as much milk-sugar as can be taken upon the point of a knife to be added at every meal; children over three months old drink cow's milk as it is, but always with the addition of the carbonate. I have seen dozens of children brought up upon milk thus prepared, and the majority have experienced no digestive derangements whatever. If the parents are sensible, they will abstain from giving the child *all* other kinds of food but this milk for the first three months, and at the beginning of the fourth month one other mess a day only may be allowed. The milk should be boiled immediately upon its arrival at the house, because the curdling is thereby delayed for some time. The best mess is prepared by soaking about an ounce of stale wheat bread for fifteen minutes in some cold water, when the water will be found to be slightly acid; the bread is then boiled into a uniform broth with six to eight ounces of alkaline milk, to which as much milk-sugar is added as can be taken upon the point of a knife. Meal-porridge is much preferred to this preparation, especially among the lower classes, for upon this, too, a great number of children thrive excellently well, and it is yet a question whether this preparation is not as harmless as the bread-pap. When four-fifths of the children brought up by hand get meal-porridge, and only one-fifth bread-mess, then, in assumed equal digestibility of both nutriments, four children fed upon meal-porridge ought to suffer from indigestion before one child fed upon the bread-mess finally becomes sick.

Now whoever is not aware that actually four times as many children eat meal-porridge as eat bread-mess, very naturally must form the idea that the former is by far less favorably tolerated than the latter. But careful detailed comparative tables, continued for years, demonstrate [illegible] indisputable [illegible] maintain that [illegible] meal-porridge is more [illegible] than bread. In addition to the bread-mess, wheat flour [illegible] may also be employed. [illegible] A teaspoon-[illegible] porridge [illegible] water is [illegible] milk are [illegible] and [illegible] consequences [illegible]

[illegible] milk is [illegible] must [illegible] well [illegible]

	Blood-forming material.	Caloric-generating material.
In woman's milk	1	3.8
" cow's milk, fresh	1	3.0
" cow's milk, skimmed	1	2.5
" wheat-flour	1	5.0

A mixture of wheat-flour and cow's milk may therefore be easily produced that will present the same proportions of blood-forming and caloric-generating component parts as human milk; wheat-flour, however, reacts acid, and contains much less alkali than woman's milk, less than is requisite for the formation of normal blood, and, finally, a totally unnecessary labor, the conversion of the starch-flour into sugar, is imposed upon the infantile organism. It is, therefore, desirable first of all to convert the starch-flour to the soluble form of sugar and dextrine; this is easily accomplished by the addition of *malt-meal* to the wheat-flour. When milk and wheat-flour are boiled into a thick soup, and malt-meal is added to this still hot soup, the mixture in *a few minutes becomes liquid and acquires a sweet taste;* upon this and upon an addition of an alkali in order to neutralize the acid reaction of the wheat-flour is based the formation of *Liebig's* soup.

The method prescribed by Liebig himself is as follows: "Half an ounce of wheat-flour, half an ounce of malt-meal, and seven and a half grains of bicarbonate of potassa, are weighed off; they are first mixed by themselves, then with the addition of one ounce of water, and lastly, of five ounces of milk; the mixture is then heated upon a slow fire, constantly stirring it until it begins to get thick; at this period the vessel is removed from the fire, and the mixture is stirred for five minutes, is again heated, and again removed when it gets thick, and, lastly, it is heated till it boils. The soup is purified from bran by passing it through a fine sieve (piece of fine linen), and now it is ready for use. Barley-malt can be obtained at any brewery. First, it is separated from the impurities, and then ground in an ordinary coffee-mill to a coarse meal. Care should be taken to use the common, fresh wheat-flour, *not the finest*, because it is richer in starch-flour. Two parts of kali bicarb. crystal are dissolved in eleven parts of water, which will make a perfectly clear liquid. The troublesome weighing of the materials may be dispensed with, as a heaped tablespoonful of wheat-flour weighs pretty nearly half an ounce, a like tablespoonful of malt-meal, not quite so heaped, likewise weighs half an ounce, and an ordinary thimble filled with the solution of the bicarbonate contains nearly fifteen grains of the salt. Now, if in addition one ounce and five ounces of water are caused to be weighed off in a beaker-glass by the druggist, and the height of the fluids is marked by strips of paper pasted on the outside, then every thing is conveniently arranged for a sensible mother; the bicarbonate of potassa cannot be replaced by the bicarbonate of soda, as important potassa salts enter into the conformation of all our food, the milk and blood-corpuscles. The soup thus prepared tastes tolerably sweet, and, when properly diluted with water, is tolerated even by nurslings. This soup, according to my own experience and that of many German physicians, is the best substitute for the mother's milk, and has visibly saved the life of many totally-atrophied children.

The greatest difficulty in large cities will always be the procuring of fresh, unadulterated milk. The milk obtained from general dealers is always far from being satisfactory, and it is absolutely necessary for one to be present at the milking and feeding of the cow, until he has become satisfactorily convinced of the honest dealings of his milk-purveyor. The milk used should always be from the same cow, which should be allowed to roam in the free air several hours daily, and be fed almost wholly upon green fodder.

If, on account of existing unfavorable circumstances, it is impossible to obtain such cow's milk for the child, other substances must be substituted, the usefulness of which, however, when employed for a long time, is very problematical. Here belong veal-broth with yolk of eggs, gruels, salep, and carrot-broth. The latter has been very favorably spoken of, and is prepared in the following manner: One ounce of triturated yellow carrots is mixed with six to eight ounces of water and allowed to stand for twelve hours; the mixture is then pressed out through a cloth. The juice is mixed with pulverized wheat bread (one part bread to four parts juice), and boiled for a few minutes over a slow fire, and finally is sweetened with a little sugar. There are children who, under no circumstances, tolerate cow's milk. These can exist for months upon carrot-broth, mucilaginous or beef soups with yolk of eggs; they grow, however, but very slowly, and never acquire a proper amount of flesh; a trial must therefore be made with very fresh, sweet milk; often the absorption and assimilation of the milk succeed later, though at first it was not tolerated at all.

The manner in which the nutriments are to be administered to infants is not immaterial. They may be fed, from the very first day of life on, with a small spoon, or a cup having a snout, to which they readily habituate themselves, but it is better to use a sucking-bottle, because by this the facial muscles are exercised in an equal manner, as in children at the breast of the mother.

The simplest form of sucking-glasses is a common bottle of four to five ounce capacity, with a tolerably narrow neck, upon the mouth of which several finely-cut bits of delicate sponge are secured by a piece of gauze. These sponges should be changed several times daily, and are best preserved in pure cold water. When they are made to reach half an inch over the neck of the bottle, and if the gauze is made properly tense, they will imitate the form and consistence of the nipple.

If these sponges are not good or elegant enough, the bottles may be provided with mouth-pieces of gold, silver, tin, or bone. Children drink very readily out of the perforated caoutchouc caps which lately have become so popular, and which are especially recommendable on account of their cleanliness.

A very popular method of feeding infants is by the sugar-teat (Schnuller, Zulp). It is prepared by mixing pulverized sugar-crackers with milk or water so as to form a dough, which is then put into a linen rag and tied with a string so as to form a ball about the size of a small apple. This soft, sweet ball is put into the mouth of the child, when it cannot be quieted by the ordinary means, at which it instantly begins to suck, and thus may be kept quiet for hours. In general, nothing more can be said against cleanly-kept, often-renewed sugar-teats, than that the cheeks of the child, by the constant sucking, become enormously distended, and form disgusting protuberances when the mouth is closed without them. Usually, however, the contents of the rag, from its contact with the warm mouth, soon begin to ferment, the mucus of the mouth becomes acid, and directly upon that digestive disturbances supervene, and a fungous growth springs up upon the mucous membrane of the mouth, which only too often leads to a sorrowful end. It is therefore the duty of every physician to prohibit the use of the sugar-teat whenever and wherever possible; but this, in fact, can be more easily advised than accomplished; if we only think of the condition of a poor woman who all day long is plagued by a large number of small children, and at night, when she and the rest of the members of the family absolutely require rest, the crying child will not leave her arm. She will then certainly say, "The physician gives good advice, not to use the sugar-teat; he, however, is not obliged to carry this crying child about all through the night;" thus not one woman out of a hundred will withhold it from her child.

From the lower classes it will hardly ever be possible to eradicate this fermenting ball, and among the better classes the child has a wet-nurse, or at least proper care, and the sugar-teat is renewed often enough, whereby it is generally rendered harmless.—So much for the nutrition of the first year of life.

In the second year, the children may be allowed some soft, finely-cut meat. If they have no diarrhœa, nor are predisposed to it, they tolerate fresh ripe fruit excellently well; on the other hand, boiled green vegetables and husk fruits very generally cause them indigestion. For a child two years of age, for example, I prescribe the following diet: Mornings, between six and seven o'clock in summer, or between seven and eight in winter, milk-gruel; between nine and ten o'clock, a piece of wheat bread with very little butter on it; twelve o'clock, well-prepared beef soup, meat with a little gravy, or potato-broth, or in place of the meat a meal-broth prepared with eggs, but with very little fat, green vegetables very rarely and in very small quantities; afternoon, between three and four, bread and milk, in summer, bread with fruit; evening, at seven, beef-soup or milk-broth. Sugar, in general, agrees very badly with children, and it is highly important for their digestion to habituate them to it as little as possible. After the children have passed the third year they tolerate all kinds of vegetables, and may, when otherwise well brought up, very appropriately be allowed to eat at the table with the family; it is only necessary to refuse them very salt, sour, and highly-spiced victuals, of all others they may partake in moderate quantities. Children should not be allowed to taste wine till they are fourteen years old, even beer is absolutely unnecessary, as likewise are tea and coffee. Home-made rye bread should be substituted for the ordinary wheat bread. It is well to cause children to eat the entire meal off one plate. They should consume all the soup allowed them before they can obtain any thing from the next dish. Aside from the labor saved by not repeatedly changing the plates, children thereby acquire the good qualification of learning to eat every thing, and not to become lickerish.

If we now take up the *care* of children, we encounter, first of all, the *culture* of the skin. The vernix caseosus of the fœtus cannot be washed off with water, but must first be mixed with some kind of fat, butter, lard, or pure oil, and may then be readily wiped off with a soft cloth. Infants should be bathed daily for ten minutes, in water of 99° F. Local affections do not suffice to counteract this rule; but, in general febrile diseases, the bathing must be suspended. The stay in the water and the variations of the temperature, which in the undressing and in the rubbing of the children dry cannot be avoided, increase, as a rule, the heat of the skin and induce a higher degree of weakness.

After the first incisors have cut through, the temperature of the water may be gradually reduced to 86° F. In the first year of life it is not advisable to employ cooler baths. In the second year, when the children have less frequent movements from their bowels, and they begin to get cleanly, it is no more necessary to bathe them every day.

three or four baths a week, in water of 84° or 85° F., are sufficient. From the third year on, two or three baths weekly, in summer, daily river or sea baths, will keep the skin properly active.

Children should be taught the art of swimming; it is very useful and very invigorating to the health of both sexes. The *culture* of the skin not only requires cleanliness, but also the prevention of too great changes of its temperature, and this is accomplished by garments and warming.

At the first dressing of the new-born, attention should be paid (1.) to the umbilical cord, that it is in no way dragged upon; (2.) That the chest and abdomen are wrapped in such garments as will not hinder the respiratory acts that have but just been established; and (3.) That the upper and lower extremities are allowed to assume their natural flexions. No child should be carried about upright, until it is itself able to raise its head and rotate it a little. The physician should be very cautious in advising that the child should be inured by the aid of light garments. It certainly cannot be denied that children inured in early life develop more rapidly and stronger, are seldom ill, and readily surmount a disease they may have acquired; on the other hand, however, it must also be admitted that many intestinal and pulmonary affections of children have been induced by a too rapid change in the temperature or by insufficient covering of the breast and abdomen. When the anxious parents have at last been prevailed upon to resort to the inuring method, and the child subsequently falls sicks, the bitterest reproaches, and not unjustly, will be heaped upon the physician. I therefore always resort to the expedient, never to disparage light garments wherever I meet with them, nor to absolutely insist upon them. Neither can unreasonable excesses of too warm or too cold garments be tolerated. When children learn to walk, they should have shoes with tolerably broad soles, which should be at least half an inch larger than the foot. Vain mothers begin at a very early period to direct their attention to the formation of a slender waist for their little daughters, which of course cannot be prevented in many cases; for motherly vanity is a vexatious enemy to the rational physician.

Finally, as regards the nursery-room, the child in the first eight days of its existence should be kept in a half-dark room, which is gradually allowed to become brighter, till finally, after fourteen days, the young eyes are perfectly accustomed to the light, and may be exposed to it without harm. From this time forth the nursery should be bright; it should have at least two windows, the floor should be painted or covered with oil-cloth, so that no water should permeate it, and the stove should only be used for heating the room and not for cooking-purposes. For the purpose of thoroughly ventilating the room the windows should be kept open one half or one hour daily, during which time the child, of course, is to be removed to another room. Fresh air is undoubtedly an absolute necessity for a robust development. Children born in summer should be taken out in the air from the second or third day on; in winter, however, eight or ten weeks at least should be allowed to pass by before they can be carried out on a sunny noonday. Older children can never be out too much in the fresh air; the earlier they are sent out, and the later in the day they are called in, all the better do they develop. In cities, the physician therefore finds it necessary to insist with the utmost energy that families should hire themselves gardens or shady grass-plots, where children may remain undisturbed the entire day. The promenades in public places, so much in favor with the nursery-maids, cannot in any way replace the undisturbed enjoyment of the child in a private park.

PART II.

SPECIAL SUBJECTS.

CHAPTER I.

DISEASES ORIGINATING DIRECTLY IN CONSEQUENCE OF DELIVERY.

Although, in a discussion on the diseases of children, it appears perfectly conformable with the purpose to adopt the plan of the latest works on Special Pathology, to simply take up the diseases of one part of the body after another, and not to base the classification upon the nature of the pathological alterations, still in the "Pædiatrica" we meet with a class of affections which have a definite physiological connection, and therefore must also be jointly treated of before all others. It is those diseases which are indebted for their origin to the act of the delivery, and to the transposition of the child from the uterus into the atmospheric air alone. Here belong: (A) Asphyxia of the new-born; (B) Atelectasis of the lungs; (C) Cephalæmatoma of the new-born; (D) The pathological conditions of navel; (E) Trismus neonatorum; (F) Sclerema; (G) Melæna; (H) Icterus of the new-born, and (I) Ophthalmoblennorrhœa of the new-born.

A.—*ASPHYXIA NEONATORUM.*

Syncope of the new-born, or asphyxia (from *a* privativum and σφύζις, the pulse), is a condition in which the inspiratory muscles after the delivery do not contract at all, or only imperfectly, and the breathing therefore does not commence. The movements of the heart continue here tolerably rhythmical, although they are feeble and not always perceptible, and only heard on auscultation; the name asphyxia does not, therefore, seem to have been very happily selected for this affection. Two different forms of asphyxia are distinguished in the new-born; in the one form the children are cyanotic, usually they are very large and strongly developed, the integument is infiltrated, the tongue thick and blue, protruding from the mouth, the eyeballs project from their orbits, and the cardiac beats are feeble and unrhythmical. This form is also called asphyxia apoplectica, because it is probably due to a congestion of the brain, in consequence of imperfect action of the heart. In the other form the children are deathly pale, the extremities hang down powerlessly, the lower maxilla drops down upon the sternum, the cardiac impulse and the pulsations of the umbilical cord are irregular and barely to be felt, the respiration is either totally absent, or the thorax at short intervals rises short and spasmodically, and the meconium flows off involuntarily. The respirations constantly grow more infrequent, the cardiac beats feebler, and death usually ensues in a few hours. Between these two principal forms there are transitions which do not reflect perfectly either of the delineations just sketched; in general, however, they are rare.

Etiology.—Asphyxia has various causes. It may originate from compression of the umbilical cord against the pelvic walls, or the cord is wound around the neck of the child, or the placenta has become prematurely detached. The skull may have suffered in its passage through the narrow pelvis or from the forceps, or the air-passages are plugged up with blood and mucus. Finally, early deliveries, feeble parents, and especially exhausting diseases of the pregnant mother, are known to be causes of asphyxia. Compression of the larger blood-vessels of the neck can only induce the apoplectic form, because a pressure that will merely make the arteries of the neck impermeable can scarcely produce asphyxia, as the more superficial cervical veins, with thin coats directly beneath, will only suffer. The flow of the blood to the head does not thereby become arrested, its return only is hindered.

Compression of the navel-string, on the contrary, exercises an influence over the umbilical vein before it does over the arteries; more blood flows, therefore, from the fœtus than to it, and anæmia with exhaustion, and, finally, the so-called asphyxia nervosa, can only result from this condition.

Pathological anatomy does not here supply any constant results. At the autopsy, nothing but a still tolerably complete fetal circulation is found, and, in particularly violent deliveries, or very unfavorable pelvic disproportions, extravasations of blood between the meninges or in the brain itself.

The course of this evil, as may of itself be understood, must be a very rapid one; if no regular respiratory acts and distinct cardiac beats take place in a few hours, life will cease altogether, which termination more frequently occurs in the nervous than in the apoplectic form. Very often, with proper assistance, the respirations are established after some time, the beats of the heart become stronger and more rhythmical, and the cyanosis in the one form, as well as the abnormal pallor in the other, disappears completely.

Therapeutics.—The treatment depends mostly upon the cause. First of all, the mouth should be thoroughly cleaned, and this is best accomplished with the finger. By touching the palate and epiglottis, slight acts of choking and coughing are induced, which alone may suffice for the establishment of the respirations. If nothing was achieved by the cleaning of the mouth, then, in the cyanotic form, two tablespoonfuls of blood should be allowed to flow from the severed funis. If the cord does not bleed any more, all further attempts at abstraction of blood must be renounced. Pale children very naturally tolerate no loss of blood, and are rather to be guarded against it by carefully tying the cord. A very simple and always handy remedy is, a few slaps with the open hand upon the buttocks. Partly from the pain, partly from the shock, very useful reflex actions of the respiratory muscles ensue. If this procedure is also ineffectual, the child should be put in a warm bath, taken out in a few minutes, swung up and down several times, and then put into the bath again. A beneficial stimulation of the skin ensues from these alternate warmings and coolings of the child. Irritating fluids may also be dropped upon the chest, among which, vinegar, brandy, ether, and Cologne water, are the most useful remedies. A very much liked, often praised, and then again discarded procedure is the direct inflation of air. For this purpose, the mouth and nose having been first cleaned, the physician applies his own lips to the open mouth of the child and blows, when naturally the air will come out at the nostrils of the child; if they are so permeable, the physician should compress them with his thumb and forefinger and then blow in air anew. It is a great error to suppose that any air is forced into the lungs by this method; in most instances, the epiglottis, through the distention of the mouth with air, becomes depressed still more firmly upon the larynx, and then all communication between the mouth and lungs is completely cut off. Still, the irritation originating from the distention of the mouth may possibly have a similar effect to that produced by touching the glottis or tickling the fauces.

If it is really desired to blow air into the bronchi, then *Chaussier's* instrument especially constructed for that purpose should be introduced into the trachea, the epiglottis having been previously elevated by the point of the index-finger. Many and renowned obstetricians, however, discard the inflation of air altogether, and experiments performed upon new-born animals, which have been artificially asphyxiated by immersing them in warm water, also speak against it. It is rational to lay the child upon the right side, with the upper half of the body slightly elevated, because by that the right auricle will come to lie downward, the left upward, and thus the blood that has entered the right auricle will have to mount straight upward if it desires to reach the left auricle directly through the still open foramen ovale instead of passing downward into the right ventricle. This posture may facilitate the closure of the fetal passage by the valve. Electricity will always be the surest means of causing the inspiratory muscles to contract. And, as the inspiratory muscles can only dilate the thorax at the expense of the lungs, the alveoli must therefore become filled with air, which, if it once properly fills and distends them, cannot escape again so rapidly, and will continue to act more and more as a stimulus for repeated inspiratory movements; the greatest difficulty which we have to contend with here is that there is "periculum in mora," and that to produce an electric current always requires a certain amount of time and knowledge which can hardly be expected of a midwife.

All these attempts at animation are to be persevered in so long as the beats of the heart can still be perceived by auscultation. Not until these have been inaudible for several minutes may we abstain from all further attempts and pronounce the child dead. If we succeed at all in saving an asphyxiated child, then we usually accomplish it in one or at the most in two or three hours.

B.—*ATELECTASIS PULMONUM.*

If the inspiratory muscles do not contract sufficiently and regularly after the birth of the child, the lungs will also be but imperfectly and irregularly distended; in some parts the alveoli will retain their fetal condition; they will be airless and remain collapsed. This anatomo-pathological condition is called *Atelectasis* (from α priv., τελος, the end, and ἡ ἐκταις, the dilatation).

A whole lung or an entire lobe is seldom found affected; generally a few scattered lobules, especially posteriorly and downward, are observed to be atelectic; they are sharply defined in both lungs, dispersed throughout the parts that contain air, are bluish-red in color, and compact, do not crepitate on pressure, and sink in water; the cut surfaces are smooth, regular, and not granular. The atelectic portions of a lung may be easily inflated, but these inflated parts still remain of a darker color than of that by which they are surrounded. Atelectasis is satisfactorily differentiated from lobular pneumonia, by this possibility of inflation of the atelectic parts. In addition, the passages of fetal circulation in most of these children are found still pervious; no trace of inflammatory exudation, however, is to be detected in any part of the lungs.

Symptoms.—Generally, the children come asphyxiated into the world, or at least they breathe from the time of birth but superficially and imperceptibly; their voice is characteristic of the evil. They are neither able to cry loud nor continuously, but will only utter a few single, weak, moaning cries, and are also unable to suck actively or continuously for any length of time. Sometimes they are temporarily cyanotic, sleep much, and have a pale, cool skin. The pupils act slowly, are slightly dilated; the pulse is feeble and slow. The percussion-sound of the thorax, when the atelectasis is not very extensive, is scarcely ever altered, in general somewhat less sonorous than in healthy new-born. Owing to the slight motions of the thorax, the respiratory sounds are naturally very feeble. Bronchial respiration is scarcely ever heard over the atelectic portion of the lung; crepitating rhonchi, however, may sometimes be detected. If this condition has existed for several days, spasmodic contraction of the facial muscles and general convulsions come on, the respiratory and circulatory movements constantly grow feebler and slower, the skin becomes cooler, and the children either die by degrees, or expire suddenly during a severe tonic or clonic convulsive attack.

Causes.—(1.) Asphyxia and all the conditions mentioned in connection with it. Atelectasis itself may be regarded as a milder degree of protracted asphyxia. (2.) Premature and feeble children. (3.) Authors also consider the inhalation of too cold air as a cause; it is much more probable, however, that pneumonia originates from the inhalation of cold air; and (4.) Too rapid and easy deliveries are stated to give rise to atelectasis. Atelectasis acquired some time after birth will be spoken of further on, in connection with pulmonary affections.

Treatment.—The treatment is precisely the same as for asphyxia. As a prophylactic, it is of importance to cause every child, in the first moments of its life, to cry loud and continuously, for the purpose of which the remedies recommended for asphyxia are the most appropriate: inflation is totally useless here, but the utmost benefit is derived from the cautious application of electricity to the pectoral muscles. As regards general rules, the children should be confined to a room of uniform temperature, of at least 59° F., and be kept as warm as possible, by warm garments and bottles filled with hot water; their attitude should be changed frequently, and they should be carried about. They should not be fed with a spoon, but be made to suck, even if it costs them some exertion, because deep inspirations also originate through that. I once used the emetic recommended by Jörg, pulv. r. ipecac. gr. ii, but with an unhappy result, and since then confine myself to tickling the palate and epiglottis with the finger, once or twice daily, which induces violent retchings, followed by correspondingly deep inspirations.

An attempt has also been made to imitate the respiratory acts by external pressure; the extremely flexible thorax of the new-born is, in this procedure actively and gradually compressed with the hand, the back of the child resting upon a firm support. Neither from this measure have I seen any favorable results, which in fact could scarcely have been expected, for these jerking compressions of the thorax have no more resemblance to the inspiratory movements than the corking of a bottle with its opening.

C.—*CEPHALÆMATOMA.—BLOODY TUMOR OF THE HEAD.*

Symptoms.—The bloody tumor of the head, cephalæmatoma (from ἡ κεφαλή, the head, and αἷμα, blood), also called thrombus neonatorum, is a painless, soft, elastic, distinctly-fluctuating tumor upon the scalp, and is produced by an extravasation of blood between the pericranium and bone, and, for the purpose of more accurate definition, is also called cephalæmatoma subpericranium. The extravasation most probably occurs during the delivery; for as early as the first day of life, when the common caput succedaneum begins to disappear, a very distinct swelling is noticed, which remains from the fourth till the sixth day, at the longest, when a tumor of the size of a ripe apple is discovered upon one of the parietal bones. Usually it is observed on the right side, and is only exceptionally met with on both parietal bones. They never extend over a suture.

When this tumor has existed for several days, the finger, in travelling toward it from the normal scalp, encounters a firm bony ring which surrounds the base of the tumor. This is a bony exuberance which has developed itself between the bone and the periosteum, which is elevated by the extravasated blood (Pl. II., Fig. 5, No. 6), and denotes the commencement of absorption. Gradually the tumor loses its softness, and imparts to the finger a peculiar sensation or noise, due to a commencing formation of bone upon the surface of the pericranium facing the extravasation. By degrees the tumor decreases in height, constantly becomes harder and flatter, and, after three or six months, an irregularity or inequality of the bone is only detected by carefully feeling with the finger, and the scalp at this time may easily be moved over the tumor. Cephalæmatoma is a tolerably rare disease, and occurs only once or, at the most, twice, in one thousand new-born children.

Etiology.—Its cause, according to *Valleix*, seems to be the following: In most of the easily-delivered children, an ecchymosis of the pericranium is found, three inches in length and two in width, extending to both sides of the sagittal suture, more extensive, however, on the right parietal bone than on the left. Most probably it is due to the circular pressure of the dilated os uteri. In fact, these ecchymoses are most frequently met with on those places where the cephalæmatomæ generally occur, so that the latter seem to be only a higher degree of those small hæmorrhages which commonly occur.

In the frequency of difficult deliveries and the rarity of cephalæmatoma, it will certainly be necessary to assume an especial thinness or friability of the vessels of the cranium, in addition to this mechanical circumstance, and the cephalæmatoma in *breech deliveries* observed by *Nägele*, *Hüter*, and *Meissner*, show conclusively that the affair is not so simple as *Valleix* supposed, but that still other causes must participate here.

In addition to these peculiar bloody tumors of the bones of the head, hæmorrhages upon and beneath the Galea aponeurotica likewise very rarely occur after difficult deliveries, especially as a result of the use of the forceps; they are very diffuse, never have an osseous ring, and are more rapidly absorbed than the genuine cephalæmatoma, attended by a greenish and brownish discoloration of the scalp. Pl. II., Fig. 6, exhibits a section of such a cephalæmatoma subaponeuroticum sive spurium.

Finally, conjointly with the true cephalæmatoma, but also without it, an extravasation of blood is occasionally found upon the internal surface of the skull, between the bone and dura mater (Pl. II., Fig. 7). Convulsions and paralysis are the usual consequences here of pressure on the brain. It is not possible to diagnose positively this meningeal apoplexia; when, however, these symptoms supervene upon cephalæmatoma subpericranium, then the complication of cephalæmatoma meningeum may be assumed with tolerable certainty. This process usually terminates in death.

Besides being liable to be mistaken for C. subaponeuroticum, the genuine cephalæmatoma may also be confounded with:

(1.) *Caput succedaneum*, the common tumor of the scalp. It is an œdema of the scalp, does not fluctuate, and pits on pressure. It disappears in the first twelve or twenty-four hours, whereas cephalæmatoma is scarcely perceptible at birth, grows from day to day, till, at the end of eight days, it has attained its greatest dimensions, and becomes surrounded by a bony ring. The cephalæmatoma is often hidden by the caput succedaneum for the first twenty-four hours.

(2.) With *congenital prolapsus of the brain* (hernia cerebri congenita). Rupture of the brain never occurs on the parietal bones, but always *between* the cranial bones, in the sutures and fontanels. It bulges out more when the child cries or coughs, and easily induces convulsions. The scalp covering it is mostly thin and devoid of hair.

(3.) With *vascular tumors.* These are very rare in the new-born; and, when they do occur, are very seldom met with upon the scalp. They do not fluctuate, have a doughy feel, and no bony ring. The integument covering them has a bluish tinge, due to the strongly-developed veins beneath.

Treatment.—The treatment may very readily be divined from the delineation which we have given of the course of the evil. If the cephalæmatoma is quietly left to itself, is not squeezed, the skin covering it is not irritated, and no surgical procedures are undertaken, it becomes completely absorbed, as stated above, in from three to six months, the children at the same time continue to develop without any hinderance, suffer no pain when the uneven bone is pressed, and, in general, experience no bad effects from the entire process and its sequelæ.

Notwithstanding these incontrovertible facts, there are a number of methods of treatment which have been invented partly by surgeons anxious for an operation, and partly by altogether too meddlesome physicians. The tumor has been washed with all possible aromatic waters, been smeared with iodine, ammonia, and blue ointments, etc., etc. A mild pressure has been exercised upon the tumors by pencilling them with collodium, or by a tin plate with which the child's cap was lined, caustics have been applied, setons introduced, and, lastly, the blood has been evacuated from the tumors by puncturing, slitting, or even by dividing them by a crucial incision.

Compression, cauterization, puncturing, and incisions, only cause harm and danger through irritation of the scalp, and exposure to the air of the bones denuded of periosteum. In the so-called discussive treatment, the most harmless remedies are the best, and I therefore use only some indifferent kind of fat, which is daily rubbed upon the tumor. According to *Fürth's* report, I learn to my satisfaction that, for many years back, sixty-nine cases have been treated in the Vienna foundling-houses on the purely expectant plan, and with the best results.

D.—*DISEASES OF THE NAVEL.*

After the cord has been divided, the portion remaining adherent to the abdomen of the child begins to dry up, and falls off between the third and tenth day. The time for the separation of the cord from the body is subject to the formation of the funis; when it is thin, it will drop off rapidly; when thick, or, as the midwives say, fat, it requires a longer time for the water contained in the Whartonian gelatinous substance to become absorbed or evaporated. As a result of the customary enveloping of the cord in a rag, and of confining it by the belly-band, it becomes flattened like a piece of tape, on which the arteries and vein are seen as three dark stripes. At the place where the Whartonian gelatinous substance joins the abdominal walls, the integument, at the shrinking of the umbilical cord, becomes contracted into a radiated depression, and, when the cord finally falls off, a tolerably firm, dry cicatrix is found to have formed. In some instances the integument is found prolonged for some distance upon the cord, by which, after the latter has dropped off, a disproportionately large pad and a deep funnel result, a condition that has been denominated "flesh navel," and is delineated on Pl. I., Fig. 9, a and b.

In fat umbilical cords, this process of cicatrization is less advanced; instead of the cicatrix, a red, inflamed, humid, or an actual suppurating surface appears, from which various pathological conditions originate. The desiccation of the cord progresses only in the living child; when the new-born dies, soon after birth, the cord *does not desiccate*, but quickly begins to *rot*, and, in medico-legal autopsies, this point may serve as an index in determining the time when death ensued.

Treatment of the Normal Navel.—In order to obtain a uniform desiccation and dropping off of the umbilical cord, it is necessary to protect it from all traction and maltreatment. It should be wrapped up in a fine soft piece of cotton or linen rag, and confined to one side by the belly-band. In dressing and undressing of infants, as well as during bathing them, all handling of the navel-string, that is constantly becoming stiffer, should be avoided, and the attempt should never be made to pull or twist the cord with a view to its speedy removal.

The following pathological processes occur during or after the fall of the cord:

(1.)—INFLAMMATION OF THE UMBILICAL VESSELS (*phlebitis and arteritis umbilicalis*).—It sometimes happens fortunately, however, but rarely, that the coagulated gelatinous substance which fills out the umbilical vessels, beneath the abdominal muscles, becomes purulent, decomposed, and produces a sero-purulent discharge from the navel. By pressing around it, a few drops of serum may be squeezed out at one time. Owing to the pain and inflammation, the children are very restless, exercise the abdominal muscles as little as possible, and invariably have fever. Soon pyæmic inflammations of the serous membranes, or erysipelas of the abdominal parietes, become superadded thereto, and the children perish, at the longest, by the end of the third week. When, exceptionally, no purulent absorption occurs, the discharge grows less, and the navel, after several weeks, becomes firmly cicatrized. But, as these cases of phlebitis are especially observed in lying-in houses where puerperal fever prevails, it is generally followed by pyæmia and death.

Treatment.—The treatment is very simple; no crusts are allowed to form upon the suppurating surface, by keeping it constantly covered with compresses dipped in warm water, and also by syringing the parts with warm water every two or three hours. The main indications always are the speedy removal of the child from the infected lying-in hospital, and to provide for it a strong, healthy wet-nurse, which, of course, can only be achieved in the fewest number of women confined in a lying-in asylum. If compelled to feed the children by hand, milk and water, or milk with tea, will serve during these processes to prolong life. Diarrhœa must be arrested as quickly as possible by muc. gi. arab. ℥ j, with tr. opii camph. gtt. j, of which one or even two teaspoonfuls may be given.

(2.)—BLENNORRHŒA AND ULCERATION OF THE NAVEL.—In fat navels, or in consequence of uncleanliness and maltreatment of the new cicatrix, it begins to discharge after the manner of mucous membranes. This, however, is readily arrested by the use of lead-water, compresses, or by touching the surface with lunar caustic. But, when this condition has lasted for some time, small excoriations begin to form upon the abdomen, the whole surrounding integument becomes inflamed, is painful to the touch, and a round ulcer, of the size of a penny, forms. In the worst cases, perforation of the ulcer, peritonitis, and death, may follow.

Treatment.—By the application of tepid-water compresses, and subsequently touching it with lunar caustic, cicatrization of the navel will almost always be attained, if the children in other respects are well nourished and suffer from no digestive disturbances; in the contrary case, the pain and suppuration of the ulcerating navel naturally contribute to hasten the atrophy and exhaustion.

(3.) GANGRENE OF THE NAVEL.—In feeble children delivered in lying-in houses, where puerperal fever prevails, an umbilical phlebitis, or even the just-described ulcerating navel, may become *gangrenous*; it becomes converted as it were into a grayish-brown sphacelous mass; the gangrene rapidly encroaches upon the abdominal walls, the epidermis becomes loose, may be pulled off, and the cutis found beneath has a gray, bluish color. Bloody serum occasionally exudes in tolerable quantities from between the sphacelous mass. In most instances peritonitis rapidly supervenes, and the fæces may also escape through a gangrenous ulcer if agglutination of a portion of the intestines with subsequent ulceration has taken place. These patients but very rarely recover; in case of recovery, the gangrene becomes circumscribed, the slough falls off, and a granulating surface remains behind. The usual termination is death in from eight to fourteen days.

In the *treatment*, unsparing cleanliness and a good wet-nurse are the most important agents; chlorine-water compresses, or water containing tr. myrrh, are very useful for the purpose of eradicating the gangrenous odor. Pure coffee with milk and sugar, or a few teaspoonfuls of wine, will always prove the most effectual means of supporting the extremely depressed state of the health.

(4.) ULCERATION OF THE UMBILICAL STUMP—(*Fungus Umbilicalis*).—Sometimes after the cord has dropped off, and before it has become cicatrized, a pediculated excrescence springs up from the raw surface, which may attain to the size of a pea and larger, and, of course, hinders the formation of a cicatrix. The adjacent abdominal integument becomes puffy, red, and excoriated, and by neglecting these symptoms there is great danger of gangrene supervening. If excoriations have already formed, they should first be thoroughly cleansed, and the umbilical fold should be fully opened, so as to enable one to ascertain accurately the cause of the ulceration of the stump, for very often it becomes covered by the puffy folds as is represented in Fig. 8 on Pl. II. If the stump and umbilical folds are excoriated, it might be supposed that a wound existed, and this erroneous supposition can only be avoided by thoroughly opening and carefully examining the fold. The *treatment* consists in abscission or deligation of the stump. Abscission may be performed without any assistance; the umbilical fold is stretched out with the left hand, and the pedicle is severed with a Cooper's scissors in the right, after which the bleeding surface is touched with a piece of lunar caustic. In the deligation both hands have to be employed, and an assistant is therefore required, who is to stretch out the umbilical fold with one hand, while with a probe in the other he pushes down the ready-made noose as deep as possible. As the ligature is tightened it cuts through the stump, and here also a slight hæmorrhage takes place, but which is readily controlled by lunar caustic. From what has just been said it follows that the abscission of the pedicle is much easier, simpler, and just as devoid of danger as the deligation. I presume that, if this pediculated stump were left to itself, it would desiccate by degrees and die, and a spontaneous cure would thus take place.

(5.) HÆMORRHAGE OF THE NAVEL.—After the navel-cord has fallen off, and before complete cicatrization has taken place, highly dangerous bleeding occasionally occurs, which is but seldom possible to control. Suddenly and without any cause the belly-band is found to be bloody, and, when it is untied, drop after drop of blood is seen to well up out of the umbilical depression. If the blood is gathered up in a watch-glass it will take several days before it becomes coagulated, and the coagulum that has finally formed remains loose and flocculent. The children continue to bleed and perish in a few days, having become extremely anæmic, with petechiæ and ecchymotic spots dotting the whole surface of the body, and which at the autopsy are also found upon the pleuræ and pericardium. This disease, on the whole an extremely rare one, for it only occurs once in 10,000 new-born children, I have seen but once; at the autopsy the umbilical vein and arteries were found to be completely filled up with thrombi. This child died on the eleventh day, and the father informed me that he was the son of one who was predisposed to hæmorrhage; that he would bleed for days from any slight and ordinary cut, and that at one time he lost so much blood, after the extraction of a tooth, that he remained pale and feeble for many months thereafter. Hæmorrhage of the navel is, therefore, with probability to be regarded as the first indication of a hæmorrhagic diathesis and blood dyscrasia, and that is probably also the reason why these cases of hæmorrhage occur so infrequently.

Treatment.—The ordinary local hæmostatic remedies and the very much praised liq. ferri sesquichlor. are totally inert here, as also the deligation *en masse* advised by *Dubois* and *Scanzoni*, accomplished by deeply transfixing the navel crosswise with two needles, and twisting a ligature over them in the form of a figure of 8, proved ineffectual in my case, as the blood continued to flow from the new punctures made by the needles. *Thomas Hill* has cured a case by pouring a solution of plaster of Paris upon the freshened wound of the navel, and filling up the fissures and cracks originating subsequently with new plaster; this method is at any rate devoid of danger, and easily carried out, and therefore deserves future trials. The treatment recommended by some surgeons, to search for the umbilical arteries and vein, and when found to deligate them, is based upon the erroneous supposition that the blood comes from these vessels; but the case alluded to proved that the hæmorrhage had no such origin. If the theory of a blood cachexia is adhered to, which until now has had the greatest probability, it will very readily be perceived that all operative measures have to be discarded.

(6.) RUPTURE OF THE NAVEL—(*Hernia Umbilicalis*).—By rupture of the navel, two conditions are briefly understood, which have scarcely any resemblance to each other, namely, congenital and acquired rupture of the navel (exomphalus, omphalocele congenita, *rupture of the umbilical cord*—hernia umbilicalis, omphalocele acquisita, *rupture of the umbilical ring*).

Congenital rupture, or rupture of the umbilical cord, is due to an arrest in the development of the abdominal coverings, in the fissure of which the rupture makes its appearance. The abdominal plates of the embryo, which grow right and left from the primitive lines or stripes, are the first rudiments of the abdominal parietes; they grow into the germinal vesicle, approach each other with their borders, and by that means enclose a cavity—the future abdominal cavity—in which a portion of the germinal vesicle becomes constricted. This constricted portion of the germinal vesicle is converted into the intestinal canal, which communicates by a passage with the portion of the vesicle lying outside of the belly (umbilical vesicle). This passage is the *intestinal navel;* the borders of the still incompletely united abdominal plates surrounding it form the *membranous navel* (*Hautnabel*). Now, if this constriction, which, up to the seventh or eighth week of fetal life, is absent, does not take place properly, the alimentary canal will develop itself in the open vesicle, will thereby keep it permanently open, and the liver is very much disposed to pass into the spacious vesicle, into which it is directly urged by the umbilical vein.

If the portion of the bowel which is normally retained at the base of the navel-string does not return into the belly at the proper time, and continues to develop itself in the umbilical vesicle, it will finally attain a dimension that will also prevent its return into the abdominal cavity after the delivery, as fruits, which, while unripe, have been introduced into a bottle, are found impossible to be extracted when they have become ripe.

But, if a part of the liver shares the umbilical opening in conjunction with the bowel, then the liver, by its density, will keep the ring wide open, and the bowel contained in the vesicle, through its increase in size, returns again into the abdominal cavity. Those congenital umbilical ruptures, in which a portion of the liver does not intervene, can never be reduced, the knuckle of intestines becomes gangrenous immediately after birth, after the cord has fallen off, followed by peritonitis and death. Congenital ruptures which contain a section of the liver, possibly, are capable of undergoing a spontaneous cure. The peritoneal coat of the liver becomes covered with granulations, the large opening gradually contracts, and a firm cicatrix forms. *Debout* has seen a case cured in this manner. The treatment is very simple: the granulating surface is covered with a piece of lint smeared with cerate, and the child is nourished as well as possible.

The acquired rupture, rupture of the umbilical ring, occurs several weeks or months after delivery, after the cicatrix of the navel has formed at the right time and in a proper manner, and is principally observed in rather lean children, who suffer much from flatulence and cry continuously. The umbilical ring is stretched a little, and the abdominal pressure forces a piece of the small intestines through it, pushing the peritonæum and the distensible umbilical cicatrix in advance, so that a protuberance presents itself instead of the usual depression, which may attain to the size of a cherry or even of a small apple. A white, glistening spot is found in the centre of the navel, which corresponds to the place where the three umbilical vessels have become united after the cord has fallen off, and has been called the *vascular navel* (*Gefäss-nabel*). It is less distensible than the *membranous navel*, and therefore is not always found upon the summit of the rupture, but either laterally or downward. The rupture usually contains a small knuckle of the small intestines, which but very rarely pushes a portion of the omentum before itself. The reduction is, in all cases, accomplished without any difficulty, after which the size of the ring may be ascertained with the point of the finger. By the use of a proper truss, the umbilical ring does not simply decrease in size, but becomes converted, as I have often observed, into a diagonal fissure, the borders of which gradually approach each other. I have never yet met with any incarcerations of the intestines here.

The treatment of this rupture, which mostly also heals spontaneously, consists in the adaptation of a stopple made of charpie, cotton-cloth, or cork-wood, but which should be a little larger than the umbilical ring, and securing it by pieces of adhesive plaster six by eight inches square, and by a belly-band, the hernia having been previously reduced. When the parents of the child have once been taught how to apply this apparatus, it may then be bathed daily and the compress is applied again after each bath. I cannot agree with the opinion of some authors, that the rupture should be supported by long strips of adhesive plaster running around and across the whole body, as the abdominal respirations are thereby very much impeded; furthermore, there is no plaster that will not erode the skin after a while, and it is much more difficult to instruct the parents how to renew this apparatus than the one recommended above; besides which, in the other case, the bathing has to be neglected for a long time, to the great detriment of the child. By this simple method, if assiduously applied, each and every umbilical ring, even though it is ever so much dilated, may be brought to a closure in from three to six months, if the child in other respects thrives well.

E.—*TRISMUS AND TETANUS OF THE NEW-BORN.*

Symptoms.—(*τριδμός*, to gnash; and *τέτανος*, rigid convulsions.) Between the first and fifth day after the cord has dropped off, never before nor later, children are sometimes attacked by trismus. Certain premonitory signs usually precede the attack, such as restlessness, crying, a peculiar trembling of the lower jaw, starting up from sleep, and avidity for the breast, which, however, the child instantly forsakes again. After these premonitions have lasted several hours, at the most a day, the child is found to be unable to open the mouth. The masticators are felt to be hard and tense, but the integument over them, in contrast with scleroma, is movable. The countenance loses the expressionless appearance peculiar to the new-born; the mouth becomes pointed, the compressed lips are corrugated by striated wrinkles, the forehead and cheeks become wrinkled, the eyes, surrounded by a bluish ring, are firmly closed, the head is strongly retracted, the nape is stiff, the skin is turgid and reddened. The child is not able to swallow; even when the jaws with difficulty have been opened and some fluid has been poured into the mouth, the nutriment invariably flows out again in a very short time. This condition, at first, has some intermissions; the spasms remit for hours at a time, so that a recovery may be supposed; they, however, invariably return, constantly grow more protracted, and mostly persist till death occurs; only occasionally do the contracted muscles become relaxed before the close of life. In the severest form of the disease, the muscles of the entire body become so intensely rigid, that the child may be raised up like a stick of wood. Death takes place in from one to eight days, by suffocation or from exhaustion. The child is either choked in consequence of the closure of the glottis during a convulsive paroxysm, or in consequence of the generally rigid, totally incapacitated inspiratory muscles. In the second case, in death from exhaustion, it is the frequent occurrence of the convulsions which produces a rapid sinking of the strength of the system. In protracted cases, the deprivation of sleep and sustenance brings about a final dissolution.

Etiology.—In very few internal diseases can the cause be pointed out with so much certainty as in trismus neonatorum. A disease that makes its appearance only between the first and fifth day after the cord has fallen off, must certainly have some connection with the cicatrization of the navel. It is also very natural, in such a rapid contraction of the tissues as takes place here, for a nerve now and then to become compressed, or be dragged, and thus produce all the reflex contractions, as we see them induced in traumatic tetanus by a foreign body. This will occur all the more readily if the umbilical cord was thick, treated roughly, and, as a result of which, ulcerations supervened. In most autopsies of children dying from trismus, marked morbid alterations in the umbilical arteries and vein are found, such as dilatation, redness, softening, ulceration of the vascular coats, pus and serum within and in contiguity with these vessels.

In Germany, the disease occurs only in the sporadic form; I have been unable to determine whether it might be more frequent at certain times or under certain changes of the weather. I have seen it at all times of the year, and under all states of the barometer, in cool and hot, moist and dry weather. In the Dublin lying-in houses, and in Mailand, trismus has been observed in an epidemic form; it is endemic in Trieste, Spain, Minorca, in the West Indies, and Cayenne. *Half* of the children born in some of the colonies of Guiana are said to perish from tetanus. It not only occurs endemically in the southern, but also in the high northern latitudes, in Iceland, for instance, where the natives designate it by the name of "lock-jaw," "chinclose." And *Mackenzie* states that it rages so violently among the children born on Westman Eyer—islands on the southern coast of Iceland—that the small population is only sustained by immigration.

Aside from the alterations in the umbilical vessels already mentioned, pathological anatomy furnishes no characteristic lesions. The plethoric condition of the spinal cord, and the bloody effusions occasionally met with in the spinal canal, are, no doubt, secondary processes. The bodies retain their wood-like rigidity for some time after death, and even in the warm seasons feel as cold as ice.

The *prognosis* is extremely unfavorable. *Golis* and *Heim*, in all their extensive practice, have not seen one case recover. *Hufeland* puts the ratio of mortality as = .50 to 1. All of my patients, at least ten or twelve, died under the best methods of treatment recommended.

Treatment.—Since, according to my experience, and that of the most extensively employed children's physicians, the once-developed trismus neonatorum invariably leads to death, it is therefore doubly important to pay the utmost attention to the prophylactic treatment; for it will not be easy to find a case in which, by strict investigation, some neglect in the care of the umbilical cord will not be discovered. Of course, where the affection prevails so endemically that a great number of the new-born are carried off by it, *Frank's* advice is to be followed, according to which, the pregnant women must leave the dangerous region and not return until complete cicatrization of the navel has taken place.

A cautious management of the umbilical cord, such as has already been described on page 49, and a cleanly, forbearing treatment of the still incompletely-formed cicatrix of the navel, to which principally a uniform temperature of 66 to 68° F., pure air, and healthy mother's milk belong, are therefore to be strictly insisted upon.

Since it has never yet been my good fortune to cure a child of trismus, I am therefore unable to suggest any remedy for the fully-developed disease, and must content myself by enumerating the various methods of treatment that have been employed and generally acknowledged as useless: (1.) The antiphlogistic treatment, especially abstraction of blood; (2.) Antispasmodics and narcotics; (3.) Diaphoretics and counter-irritants; and (4.) The evacuating method. Each of these methods of treatment has its advocates, and each has its contemners.

Of all the remedies, the narcotics are the most promising. In one case I gave tr. opii, one drop every hour; in another, one drop every twelve hours; in another, I used chloroform every two hours. In this child, the rigidity passed off during each narcotism, but returned in from half to one hour afterward. On the next day the symptoms were the same; and, as I was about to narcotize it for the seventh time, I found it was dead. The most rational treatment seems to be, not to allow the child to perish by inanition; which is accomplished by injecting, twice daily, milk or beef-tea, with yolk of eggs, into the stomach by the aid of a gum-elastic catheter, which is easily introduced through the œsophagus; and to cauterize the spot that formed the starting-point for the trismus, the cicatrix of the navel, with the ferrum candens (actual cautery), a treatment which I intend to try in the next case that may present itself to me.

F.—*SCLEROMA* (*from σκλήρος, hard*). *INDURATIO TELÆ CELLULOSÆ, ZELLGEWEBSVERHÄRTUNG* (*INDURATION OF THE CELLULAR TISSUES*).

Scleroma, by some also called œdema neonatorum, or œdema compactum, consists in an induration of some parts of the cutis, which, in this manner, occurs only in the first weeks of infantile life.

Symptoms.—The infiltration of the integument begins on the lower extremities, the redness of which increases while the temperature at the same time decreases. At first the calves of the legs swell up, and become perfectly stiff and hard; the swelling next attacks the feet, by which the soles of the feet become peculiarly convex; it then extends upward over the knees, upon the thighs, to the genitals, the pubis, nates, and navel; the thorax in a most remarkable manner is always spared; on the other hand, the upper extremities and the face, particularly the lips and cheeks, which then assume a peculiar glossy appearance, are very generally implicated in scleroma. The dark-red color of the affected places, that is seen at the invasion of the disease, very soon fades, and gives way to a yellowish; the skin becomes dry, and the epidermis, which otherwise is always cast off, does not attain to a desquamation here. In the most intense form of scleroma, the child lies intensely swollen, cold, and stiff, like a frozen corpse. The hard, glistening cheek, the puffed-up, jutting lip, the eyelids, that are more œdematous than indurated, and which are but little capable of opening themselves, disfigure the face so much as to make it entirely unrecognizable. At the invasion of the disease, the affected parts of the skin are still movable, and it is easy to make a depression with the finger in the sclerous tissues, which will last for some time; later, however, neither is possible. The depression of the temperature is very characteristic in such children, not only on the upper surface of the body, but also in the mouth, where, according to Léger's measurements, the thermometer may sink to 73° F. Artificial warmth, by the aid of bottles filled with warm water, warm cloths, hot baths, can only temporarily raise the temperature of the cold extremities, no more, in fact, than that of any other inanimate object.

All the physiological functions are here either suppressed, or but feebly developed. The respiration is superficial and slow, the voice weak and whimpering; the cry is never loud nor continuous. The child sucks only for a few minutes, and extracts but a small quantity of milk from the breasts. The meconium is not evacuated for some time, the secretion of the urine is very much diminished. The pulse is always very small and slow; according to *Valleix*, it ranges from sixty to seventy-two beats per minute; later, when the scleroma is far advanced, it can no more be felt in the extremities, on account of the induration of the integument. The action of the heart is extraordinarily feeble; the second sound is scarcely audible at all. The sensibility of the affected parts of the skin is almost wholly gone, of which it is easy for one to convince himself by pricking them with a pin.

As all the symptoms just described but gradually become intensified, a division of the affection into stages is therefore impossible and also unnecessary. The further the indurated œdema advances, all the more profound becomes the lethargy, all the slower the respiration, all the more perceptible the coldness. Finally, a bloody serum flows out at the mouth and nose, and death ensues without any convulsions, simply by the respirations becoming slower and slower, and then ceasing altogether.

In the rare cases which pass over into a recovery, deeper and easier respirations are at first observed, the action of the heart becomes stronger and quicker, the appetite increases, and lastly a diminution of the œdema of the indurated parts takes place. According to *Valleix*, the eyelids and upper arms are the first to become thin and flaccid, then the buttocks and the hypogastrium, later the hands; the legs and feet remain œdematous for some time after the other parts have become normal. So long as the feet are still swollen, the subjects cannot be declared out of danger; they sometimes become drowsy, drink less, and die in two or three weeks.

The affected parts retain the violet-red color for some time after the œdema has totally disappeared; the skin is weak, soft, and corrugated, and does not regain its normal condition for some time.

Lobular pneumonia is the most frequent complication; *Valleix* observed it five times in twenty-five cases. Intestinal catarrh is very rarely present, and that, in the difficult introduction of sustenance, is very readily explainable. Yellow discolorations of the new-born naturally frequently occur, but true icterus with yellow sclerotics, urine containing coloring matter of the bile, and gray fæces, are, on the whole, very rare in children, nor have they any special reference to scleroma.

Post-mortem Appearances.—After death the parts affected by scleroma rapidly become blue, and retain their hardness and rigidity; the rest of the skin, especially of the trunk, is normal, yellowish-white. The infiltration is most marked on the side on which the body has been placed, as a result of the fluids sinking toward the most depending parts. On incising the affected integument, black, semi-fluid blood flows out, but from the subcutaneous cellular tissue, which is so intensely œdematous, and which has produced that enormous enlargement of the extremities, a large quantity of yellow or sanguinolent liquid exudes, which neither chemically nor morphologically differs from the ordinary dropsical serum. After this fluid has escaped, the indurated parts become soft and flaccid again. The connective tissue over the aponeurosis is converted into a gelatinous mass of two to four lines in thickness; beneath the aponeurosis, in the intermuscular structure, no œdema is ever found. The solidification of the adipose tissues, which occurs when the corpse has been exposed to cold, should not be confounded with this condition. In that case, too, the extremities feel hard and stiff, but they are not swollen, and are not so blue, and, on incising, the subcutaneous cellular tissue is found normal, dry, and without any gelatiniform infiltration.

In scleroma, then, we have essentially to deal with an acute œdema of the skin, the causation of which is to be sought in general circumstances. The rest of the organs are not constantly changed; most frequently serous effusions into the peritoneal and pleural sacs are found, and lobular pneumonia occasionally supervenes. The fetal circulatory passages are sometimes closed, sometimes again still open, as is very frequently the case in infants who die in the first days of life; scleroma, therefore, cannot be regarded as having any special connection with greater alterations of the circulation.

Etiology.—Scleroma attacks by preference premature children. On the whole, it is much more easy to decide what does not produce scleroma, than what does produce it. It does not originate through the fetal passages remaining open, nor from lobular pneumonia. It is especially to be borne in mind that the retardations of the pulse and of the respirations, with the exception of those cases that are complicated with pneumonia, are constant phenomena. Most probably, therefore, it is the lack of innervation of the cardiac muscle, which does not contract often enough, and thus produces the coldness and peripheral transudation. The disease is decidedly more frequent in winter than in summer.

Treatment.— *Valleix* has seen two children recover, in each of which two leeches were applied behind each ear. Other children died under the same treatment. The most important part of the treatment seems to be to keep up constantly a high temperature of the body, which is accomplished by surrounding it with bottles filled with hot water, warm cloths, etc. It is also rational to accelerate the contractions of the heart by the administration of alcoholics; on the whole, however, it cannot be denied that all these agents, as a rule, prove ineffectual, and only in exceptional cases, in slightly-diffused scleroma, do they accomplish a favorable result.

G.—*MELÆNA NEONATORUM.*

Between the first and third days of infantile life, gastric and intestinal hæmorrhage occasionally occurs. Vomiting of blood is less frequently observed than bloody, discolored fæces. The bloody stools are almost always very copious, and recur at short intervals. The blood is sometimes fluid, and then again coagulated into large lumps. In this affection the patients sink very rapidly into a state of collapse, the lips become blue, the skin cold, the pulse is barely perceptible, and symptoms of acute cerebral anæmia supervene. Usually, the hæmorrhage runs its course in twenty-four hours; still, it may also last three to five days. The stools retain a dark color for many days after the bleeding has stopped. According to *Rilliet*, half of the children attacked by this disease recover.

At the autopsy large quantities of fluid or coagulated blood are found in the stomach and intestines, and the highest degree of anæmia in the other organs. The fetal circulatory passages are open; but this, after all, is observed in many new-born who did not die from melæna. The turgescence of the mesenteric arteries and their systems of capillaries, seen even in the physiological state and produced by the sudden closure of the umbilical arteries, so important in the fœtus, and which arise directly from the hypogastric arteries, may be looked upon as a cause of this disease. An especial thinness of the walls, or friability of the affected system of vessels, must certainly play a part here; because, otherwise, this in reality very rare form of hæmorrhage would have to occur much more frequently. The closure of the ductus venosus Arantii, and especially that of the branch of the umbilical vein opening into the portal vein, deserves more frequent and stricter investigation to explain this hæmorrhage.

Besides becoming bloody from intestinal hæmorrhage, the fæces may also assume that character through blood having gained an entrance into the mouth of the child, and then been swallowed by it. This may happen in all operations on the lips and tongue, in epistaxis, the result of a blow upon the nose, or of that organ coming violently in contact with a hard substance, from the maternal blood having been swallowed during delivery; and, lastly, the new-born may suck in some blood from the breasts of the mother when any sores exist around the nipples, or when a strong child endeavors to suck for a long time from milkless breasts. All these admixtures of blood are very rare; the blood in these cases is not found in large quantities, and usually is not ejected by the intestines, but thrown up. Nor do the infants sink into a state of collapse, as in actual intestinal hæmorrhage.

Treatment.—The only case of intestinal hæmorrhage which until now I have had an opportunity to treat, occurred in an infant thirty-six hours after delivery. In the course of twenty-four hours ten diapers were soiled by the discharge of blood-coagula, which were of the size of a hazel-nut. The strong, robust child quickly turned to a waxy paleness, the extremities became cold, and the pulse was scarcely to be felt. I caused the temperature of the room to be raised to 72½° F., laid three jugs filled with hot sand around the child, and ordered it to drink at the breast of the mother every hour. As in the course of the next twelve hours no remission ensued in the bleeding, I gave him—

℞. Liq. ferri sesquichlorat.	℈j.
Aq. distillat.,	
Aq. cinnamon āā,	℥ss.
Syr. simple,	℥ss.

Of which, in twelve hours, the child consumed about the half, and then discharged no more blood. I could not prevail upon myself to try the treatment with ice-cold milk, and cold applications to the abdomen, proposed by *Rilliet*, on account of the reduction of the temperature of the surface of the body that must necessarily result therefrom; on the contrary, I consider it more rational, in this intestinal hæmorrhage of the new-born, to induce as strong a turgescence as possible toward the integument, which is best accomplished by a high temperature. The child rallied in a few days after the bloody stools stopped, and from that time on has prospered excellently well.

H.—*ICTERUS NEONATORUM* (*from* ἴκτερος, *Jaundice*).

In addition to the physiological yellow discoloration of the skin mentioned on page 6, to which, in fact, most of the alterations of the color of the skin regarded as icterus belong, there is yet a condition in which the coloring matter of the bile is actually retained in the blood, and in many instances it is of a very serious nature. Here the sclerotica is yellow, the pus of the ophthalmo-blennorrhœa which occasionally supervenes turns to an orange color, and the urine dyes the diapers dark yellow. The fæces, however, never become as gray as in the adult, but retain a light-yellow or greenish tint. At the autopsy the serous membranes, the muscles, bones, etc., are found infiltrated with the coloring-matter of the bile, just as is seen in adult icteritics. Most of the icteritic children are feverish and suffer from a still uncicatrized and ulcerating navel, with which the icterus neonatorum stands in the closest connection. In those cases which terminate fatally, usually phlebitis of the umbilical, sometimes also of the portal vein, and small abscesses in the parenchyma of the liver, are found. True icterus neonatorum is therefore to be regarded as a local condition or complication of phlebitis umbilicalis; it is not, however, possible to maintain that a duodenal catarrh or a mechanical occlusion of the biliary ducts may not also now and then cause an icterus. In fact, all the icterus of the new-born which terminates favorably belongs to this category. Its usual causation, according to *Frerichs*, is to be sought in a diminished tension of the capillaries of the hepatic parenchyma, which ensues at the cessation of the afflux of blood on the part of the umbilical vein, and causes an augmented transposition of bile into the blood.

As regards the course of the disease, every thing that has been said of phlebitis umbilicalis, on page 59, is applicable to the cases of the first category; the subjects, at the most, linger till the fourteenth day, become atrophied very rapidly, and mostly perish under a profuse diarrhœa. The latter kind, the simple icterus, lasts from eight to fourteen days. The yellow color never becomes intense, and during the whole course the general condition is barely perceptibly disturbed.

Treatment.—The treatment of the pernicious icterus is a most unsatisfactory one. So far as I am aware, there is not one case of recovery to be found in the whole medical literature. All the more pleasing, on the other hand, is that of the yellow discoloration of the skin, falsely denominated icterus, in prematurely-born children, or after difficult deliveries. It invariably disappears spontaneously in the course of a few days, and nothing more is necessary than to pay attention to the digestion of the child. New-born children very rarely suffer from actual constipation; and, where that is the case, the universally beloved syrup of rhubarb will also be capable of removing the difficulty.

I.—*CONJUNCTIVITIS BLENNORRHOICA NEONATORUM.*

By blennorrhoic inflammation of the conjunctiva (from *βλέννος*, mucus, pus), we understand an inflammation that runs its course, not only with a profuse suppuration on the free upper surface of the conjunctiva, but also with an effusion of plastic exudation into the parenchyma thereof. The contagious, profusely-secreted pus and the uniform and simultaneous implication of the papillary bodies characterize this disease from all others.

According to the severity of the affection, we distinguish two kinds of blennorrhœa as described by *Arlt.*

First Kind.—Cases which, immediately from the beginning, are inclined to run a very rapid course, and display the tendency to attain the highest degree.

In the first grade of this form the palpebral conjunctiva is relaxed, uniformly red, and secretes a tolerable quantity of pus; all these symptoms are present in an acute form. Often the simply purulent secretion ceases suddenly and makes place for a thin serous discharge, in which flakes and fibres swim about, frequently adhering with tolerable firmness to the conjunctiva. A marked degree of swelling, an acute œdema of the lids, takes place here. Usually this condition lasts so short a time (from twelve to twenty-four hours), that the physician but very rarely has an opportunity to see it.

In the *second* grade of this form the palpebral conjunctiva is dark red and very much swollen, so that the inner canthus is no longer sharply defined, and the absorption of the tears is prevented by the constriction of the punctæ lachrymalis. The ocular conjunctiva, too, is already decidedly infiltrated and injected, the discharge is mostly like thin broth, seldom thick or purulent, and excoriates the adjacent integument. The œdema of the lids is so intense, that it is extremely difficult and painful to open the palpebral fissure.

In the *third* grade, finally, all the phenomena of the second are present, only in a more aggravated form, and, in addition, an intensified œdema of the conjunctiva bulbi supervenes. The swelling of the integument of the lids mounts upward over the supraorbital ridge, and downward extends to below the malar bone, and is uniform in degree from the outer to the inner angle of the eye, because, in reality, it is only a secondary affection of the uniformly-inflamed conjunctiva. The secretion is extraordinarily profuse, flows almost unceasingly down over the cheeks, sometimes is thin, then again thick, watery, or purulent, sometimes brownish, colored by an admixture of blood. The conjunctiva bulbi is either uniformly infiltrated, and surrounds the deeper-lying cornea like a red circular rampart or crown, or, in rarer instances, swells up irregularly in the form of weak, vesicular exuberations.

Second Kind.—Cases which, from the very beginning, have a more chronic course, and are unattended by any profuse blennorrhoic discharge. The latter increases only after several days; the morbid changes upon the entire upper surface of the conjunctivæ, however, are marked; granulations and minute warts form, which, in the palpebral sinuses, unite to form cock's-comb-like excrescences.

In the *first grade* of this *second form* the secretion is very slight; the red color, and the uneven state of the conjunctiva, combined with some intolerance of light, are its only characteristic symptoms. This condition may last several days without the morbid changes becoming intensified.

In the *second grade* the affection of the conjunctiva palpebrarum extends as follows: So far as the papillary bodies reach, on the lower about half a line, on the upper nearly one line beyond the orbital border of the tarsus, the highly-red conjunctival membrane is seen to be closely studded with compressed, uniformly-projecting, equal-sized minute warts. At first, these warts bleed at almost every touch, but when they have existed for some time—they often last, when not treated, for months—they become pale on the upper surface, flattened from compression by the eye-bulb, and bleed less easily. The strongest tendency to extuberate is always seen upon the conjunctiva toward the orbital border, where high, cock's-comb-like granulations form.

Here the tumefaction and redness of the lids are but slight, and disappear sooner than the affection of the conjunctiva.

This form of blennorrhœa seldom attains to the *third degree;* only then, as a rule, when, during the disease, still further injurious influences come to bear upon the eye. The anatomo-pathological characters, on the whole, are the same as those of the third degree of the acute *first kind.*

Course.—It does not always happen that a blennorrhœa runs through all the three degrees; it often stops at the second, sometimes even at the first. Nor is it necessary for both eyes to be implicated; usually, however, the pus of the eye first attacked infects the other, on account of which the closure of the still sound eye, more minutely to be described further on, is of the utmost importance. If an actual transportation of the blennorrhoic pus has taken place, as is most frequently the case in new-born children, the process then runs through the first and second grades so rapidly, that the physician, who is called in only twenty-four hours afterward, finds the third grade already fully developed, and the eyes, even at this juncture, may already be hopelessly ruined through extensive destruction of the corneæ.

When the affection stops at the first stage, it will terminate slowly and spontaneously, and without any serious results. Through external injuries, however, it may become aggravated to a higher degree.

The second grade is almost unexceptionally caused by contact with infecting pus. Here much less tendency to a spontaneous cure can be expected, as the extuberations of the papillæ and the preceding suppuration thereof are liable to remain, if not treated, for many months. In this chronic course the lids become markedly hypertrophied and enlarged; they never, however, become shortened inwardly; notwithstanding the subsequent cicatrization of the conjunctiva, an ectropium of the upper and lower eyelids oftener originates therefrom. In other cases, an abbreviation of the palpebral fissure (blepharophimosis) may form, as a result of the excoriations. In the second grade the cornea is but little endangered; small and superficial corneal ulcerations, generally, are only met with.

The third degree, which may develop itself at any time from the first and second, but which may also appear very acute without any inflammation preceding it, is always an extremely dangerous condition.

The Cornea, as a rule, becomes involved.—At the first examination the cornea may have been found to be perfectly clean, transparent, and glistening, but, if reëxamined a few hours after, it may already be softened, purulently infiltrated, and in a great measure destroyed. What aggravates the calamity is that this process invariably occurs in the centre, just opposite the pupil; while the periphery of the cornea, with the centre remaining undestroyed, but very rarely suffers a solution of continuity. There is a very remarkable circumstance connected with these ulcers of the cornea, and that is, that no suppuration ever takes place between the corneal layers, no unguis forms. They have an extraordinarily great tendency to perforate, the iris then drops forward, and is quickly covered with a grayish exudation, from which staphyloma subsequently becomes developed. If the prolapsed iris and the exudation covering it are not capable of closing the perforation, phthisis bulbi will take place. In general, the rule may hold good, that the later the affection of the cornea appeared, after the blennorrhœa has passed beyond the highest stage of severity, the less of a destructive tendency will it display. If ulcerations form, notwithstanding the blennorrhœa having existed for some time, say two or three weeks, they will, it is true, increase in size much more slowly; but nevertheless often give rise to circumscribed corneal perforations, and their effects, prolapsus of the iris, opaque cicatrices, anterior synechia, distortion of the pupil, central capsular cataract, staphyloma, etc. In this third and highest grade, children usually have a hot skin and fever, in consequence of pain and sleeplessness.

Causes.—Those cases which are met with in private practice must be separately regarded from those occurring in lying-in and foundling-houses. The extremely frequent occurrence of blennorrhœa in the first six to eight days of life cannot possibly be attributed to general causes alone—glaring light, cold, foul air, uncleanly treatment of the eyes, etc.—for these agents, in some measure, still remain in force for some weeks thereafter; whereas the invasion of a blennorrhœa after the eighth day of life, in private practice, is of the greatest rarity.

Hence, an *infection* through blennorrhoic vaginal mucus, during the passage of the head of the child through the maternal passages, is generally assumed, by which it is not necessary for syphilis to be present and participate. The infecting conditions are then the same as those of a gonorrhœa that has originated after an impure connection. Not every fluor albus, through coitus, produces a gonorrhœa, and still less frequently a blennorrhœa of the conjunctiva during the delivery. Were the latter the case, most of the new-born would suffer from the disease under consideration, for almost all women, during the last weeks of gestation, have an augmented vaginal secretion, a higher degree of which represents a vaginal blennorrhœa. Moreover, the children are well protected against infection during delivery by the eyelids being firmly closed, and by a proper coating of vernix caseosa, by which the rare induction of conjunctival blennorrhœa in comparison with vaginal blennorrhœa of the mother may be explained. That this manner of infection during the progress of the child through the maternal passages is not a very intense one, follows from this, that new-born male children, in the first weeks of life, never acquire a urethral gonorrhœa, nor the female a vaginal blennorrhœa. Be that as it may, this much is irrefutable, that at least from eighty to ninety per cent. of all conjunctival blennorrhœæ occur in the new-born, and that in every instance the act of the delivery, *per se*, may be regarded as the most important etiological agent.

Where many children are congregated together, in foundling and lying-in houses, blennorrhœa also occurs in an epidemic form, especially in those lying-in houses where puerperal fever prevails. Here it is especially difficult to determine in which manner the transportation of the pus takes place, since it is known that sponges, towels, diapers, and the hands of nurses, when soiled with blennorrhoic pus, are capable of conveying the poison to healthy eyes; the opportunities of infection occur in such varied and manifold forms, that it is really unnecessary to resort to the air, light, etc., for an explanation.

The *prognosis* depends entirely upon the state of the cornea. The granulations and the exuberations may look ever so frightful, the purulent secretion may be ever so profuse, still all these may pass away without leaving any traces behind them; the morbid alterations of the cornea, however, leave their effects for life. The earlier the cornea becomes implicated, all the greater is the danger of a total destruction. Primary or secondary syphilitic vaginal blennorrhœa, as a rule, produces such intense corneal participation. The œdema of the lids, as a rule, stands in exact relation to the danger of the destruction and loss of the eye.

Treatment.—The task of testing and criticising the various methods of treatment recommended by some and denounced by others is rendered difficult, by the fact *that a number of violent blennorrhœæ disappear spontaneously without medication and without scrupulous cleanliness, and leave behind them no morbid alterations of the cornea.*

In Munich, where great negligence prevails among the lower classes in regard to the rearing and prosperity of the new-born, it often happens that mothers bring to the physician their three or four weeks' old children with severe blennorrhœa, for some other ailment, and, upon closer inquiry in regard to the affection of the eye, very naïvely remark, "The jaundice attacked its eyes in the very first few days; it is much better now; at first, however, the eyes were very much swollen; matter and bloody water constantly used to run down over the cheeks." If such untreated eyes are examined, the cornea will very frequently be found perfectly clean and intact. A recovery has taken place without any treatment. In other cases, it is true, both bulbs, to the great mortification of the parents, are found completely destroyed. These facts must be candidly premised and kept in view in estimating the value of the methods of treatment now about to be described.

As a prophylactic against transportation of the blennorrhœa from the affected to the still normal eye, a protective bandaging is especially to be recommended. For this purpose the sound eye is covered with a light pad of dry charpie, which is secured by a few strips of adhesive plaster. This pad and plaster should be removed twice a day and the eye carefully examined. If the blennorrhœa has attacked this eye notwithstanding, then this bandaging has completely failed in its object, and must be wholly abandoned in order to facilitate the escape of the pus.

The most important part of the whole treatment consists in a thorough cleansing of the eye. In hospitals and lying-in houses where the children are constantly under the care of experienced persons, a reservoir secured to the wall with an india-rubber tube attached to it, by which the stream of water is conducted directly into the eye, is best adapted for this purpose. The temperature of the water should not be higher than the temperature of the room. In private practice, with proper care, the water may be injected into the eyes with a syringe; or it is allowed to flow into them from a small, narrow-spouted can, which procedures must be repeated at least every hour. A tolerable amount of adroitness is requisite to properly manipulate the syringe; usually the nurses throw the water upon the firmly-agglutinated eyelids, and, of course, as much pus remains beneath them afterward as before. I consider it very inappropriate to hold the lids apart by means of spatulæ every time the eye is cleansed, because such an intense œdema is thereby produced in a very short time, that the upper eyelid comes to drop far down over the lower, and then it is altogether impossible to obtain a sight of the globe. In consideration of these difficulties, and because with the syringe people very often throw the blennorrhoic pus into their own eyes, and thereby lose their own vision, I content myself with cutting up a fine sponge that has already been in use for some time, into angular pieces and with these cause the eye to be sponged every half hour or hour. The nurse should hold the lids open with the thumb and index-finger of the left hand, while with the moistened sponge in the right she brushes over the conjunctiva. This manipulation every person with a good-will can learn to execute; it also completely suffices to cleanse the conjunctivæ, and the pillow and child's garments are not thereby soaked through, as is usually the case with injections.

The Local Treatment.—Ever since *Von Gräfe* so strongly recommended the application of nitrate of silver, almost all blennorrhoic conjunctivæ have been cauterized. First of all, it should be observed that, for the purpose of thoroughly cauterizing the eyes, it is necessary to have an assistant, who should fix the head and properly evert the eyelids.* Either the ordinary nitrate of silver or a mitigated caustic composed of equal parts of nitrate of silver and nitrate of potassa fused together is used for this cauterization. A little olive-oil or salt water will prevent the caustic from spreading unnecessarily. The secretion, as a rule, is somewhat checked after the cauterization; it appears again, however, on the next day more profusely than ever. The eyes are cauterized from day to day, until the disease gradually disappears. Both eyelids should be brushed over every time with the caustic as far back as the orbital reflexion, because the whole conjunctiva palpebrarum is involved in the disease. That this method of treatment is painful, and that for this reason the women do not bring their children to be cauterized a second time, cannot be denied. Moreover, I have often seen perforation of the cornea ensue, notwithstanding the most carefully carried out precepts. Blennorrhœa of the conjunctiva seems to be an analogous process to gonnorrhœa of the urethra. A few years ago surgeons were very enthusiastic over nitrate of silver injections in gonorrhœa too. Now, no one resorts to them any more.

A collyrium of corrosive sublimate, or sulphate of zinc or of copper, gr. ss of the first, gr. j of the last two, to an ounce of water, is less painful and about as effectual as cauterization with the solid stick of nitrate of silver. One drop of any of these collyriæ is dripped into the inner angle of the eye, six or eight times daily; the lids are slightly opened, and the head is held in such a position that the drops will run into the eye by their own gravity. The sovereign remedy in the first days of blennorrhœa is

Cold.—But to generate continuous cold upon a given spot on the skin is not as easy as may be supposed. Compresses dipped in cold water, and laid upon the skin, assume in a very short time the temperature of the skin itself. They would therefore have to be renewed so frequently that more than one nurse would be required. But if two or three bits of ice, as large as peas, are placed between the moistened folds of the compress, the melting pieces of ice will keep the temperature of the eyelids reduced for eight or ten minutes. So small a quantity of ice, on melting, does not generate water enough to run down over the cheeks, and whatever there is of it is absorbed by the compresses. As a sure protection against wetting the body, a dry cloth around the neck is very useful. By continuously-generated cold, the œdema of the lids may generally be reduced, and the blennorrhœa kept within moderate bounds. By constant, scrupulous cleansing, an astringent eye-wash, and, when the secretion lasts longer, by the inunction of blue ointment upon the forehead, the cornea will be kept from perforation. Warty excrescences in the palpebral sinuses, where the blennorrhœa is nurtured for a very long time, are best removed with the scissors. If perforation and prolapse of the iris have taken place, staphyloma at least may be prevented by energetic cauterization of the cornea, and constant pressure. In circumscribed central leucoma, the sight at a later period may be infinitely improved by the formation of an artificial pupil. If phthisis bulbi (atrophy of the globe) has occurred, the deformity may be mitigated by an imitation eye, in the perfection of which, art of late has made such extensive progress.

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* Still, the assistant may be dispensed with, by the physician securing the head of the child between his knees; he then everts one eyelid, which he retains everted with the thumb or index-finger of the left hand, while with the right he is at liberty to handle the caustic. The other eyelids are then similarly treated.—Tr.

CHAPTER II.

DISEASES OF THE DIGESTIVE APPARATUS.

A.—*MOUTH.*

(1.) Harelip and Cleft Palate (*Labium Leporinum—Palatum Fissum*).—Harelip is a congenital splitting of the upper lip; cleft palate, a congenital fissure of the hard palate. In order to thoroughly comprehend these malformations, it is necessary to revert to the history of the fetal development.

As long as the two superior maxillæ remain ununited in the median line, with the intermaxillary bone that has originated from the central process of the frontal bone, to form the hard palate, so long will the mouth and nasal cavities stand in open communication with each other.

Now, in cleft palate, this union is arrested on one side; in harelip, a union between the bones does indeed take place, but seems to have been retarded, on account of which, the upper lip, which is formed primarily of two lateral and one central piece, does not become united; the fissure of the upper lip, corresponding to the one in which the union has been arrested, becomes skinned over like the borders of the lips, and union is subsequently altogether impossible. From these remarks, it will be readily perceived why harelip never occurs in the centre of the lip, but always on one side: the chasm invariably terminates in one or the other nasal cavity.

We have various grades of fissures, according to the time in which, during fetal life, this arrest of development has taken place.

The cleft of the hard palate may be so wide as to easily admit a finger, and all the infundibuli may be inspected without any difficulty. In this intense form, scarcely any upper lip is present, and one or both nasal orifices are immensly distended. Or the intermaxillary bone, covered with some skin, projects forward, and forms a knob under the nose. At each side of this bulb, fissures of the lip run into the nasal orifices. Or there is only a narrow fissure in the hard palate, which will barely admit the back of a knife, and, corresponding with it, the cleft in the upper lip is also less grave. Or both upper jaws are perfectly normally formed, and there is only a narrow fissure in the upper lip, the margins of which almost touch each other, and either extend clear into one of the nasal openings, or only half way to it.

There are families many members of which are deformed by harelip, so that we are compelled to assume a kind of predisposition or inheritability.

The effects of this evil are:

(1.) *Difficult Sucking, particularly in Cleft Palate.*—The act of sucking consists in the lips locking themselves hermetically around the nipple; the air in the mouth becomes rarefied by the dilatation of the thorax, and the milk is in this manner pumped out from the breasts. But, when the continuity of the lips is broken, they are unable to firmly and perfectly adapt themselves around the nipple, and infants are then incapable of exhausting the milk. When the hard palate is not simultaneously fissured, children will grasp the nipple between the jaws, instead of the lips, and in that way suck with tolerable ease. But when cleft palate is also present, then they are almost altogether unable to nurse; the overflowing breasts do indeed discharge some milk into the mouth, but the greater part flows out again at the nose; this is best prevented by holding the head of the child elevated.

(2.) *Obliquity in the Position of the Teeth.*—If the operation is not performed before the eruption of the teeth, or if it has been unsuccessful, the teeth of that part of the jaw that is not covered by lip will grow crooked, outwardly instead of downward; this is especially true when cleft palate also exists, which gives to the face a hideous disfigurement.

(3.) *Indistinct Speech.*—Some letters, to the articulation of which the upper lip is indispensably necessary, principally B, M, P, W, are but indistinctly pronounced in harelip, and are altogether impossible of articulation in cleft palate. In the latter case, all the other consonants in addition lose in distinctness on account of the defect of the palate.

Treatment.—Nothing but an operation can remedy this deformity. As regards the time when it is to be performed, much has already been written and disputed. If the nutrition of the child is much interfered with, if it does not learn in the first few weeks to suck and swallow properly, then of course it will remain backward in its development, and the operation must be performed as soon as possible. But, when this is not the case, it is best to wait until the child has passed the fourth month. At all events, however, the operation should be performed before the eruption of the teeth, for, as soon as dentition has once begun, children are oftener subject to sickness, and on that account the result often proves a failure. Moreover, children more than six months old begin to use their hands, with which they may tear down the plaster after the operation, or entangle them among the points of the pins, and thus frustrate its success.

Before the operation, the child is to be kept awake for several hours, in order that it may subsequently fall into a deeper sleep than usual; and it is also to be nursed, so that thirst or hunger may not rouse it too soon. It is best to wrap the entire body up to the neck in a sheet, and then place it in the lap of an assistant. Nothing more is necessary for the operation than a sharp tenaculum, a strong sharp scissors, the sewing apparatus, and a few strips of adhesive plaster. A second assistant now seizes a part of the split lip between his thumb and index-finger and compresses the vessels. The operator, seated opposite the child, seizes hold of the border of the lip with the tenaculum where it passes over into the fissure upwardly, pushes the scissors into the slit, and with one cut removes the entire edge. The same manœuvres are repeated on the other side. After the edges have been adjusted, two or three needles, the lower ones first, are introduced, and a few turns of the ligature taken around each one of them.

In wide-cleft palates, where scarcely any upper lip exists, the cheeks will have to be separated from the bone very far backward, in order to obtain a sufficient amount of distensible substance. All projecting teeth and bony outgrowths must, under all circumstances, be removed before the operation, and the wounds should first be allowed to cicatrize. The ligatures should not be drawn too tightly, for the circulation in the margins of the wound will thereby suffer severely, and an insufficient amount of plastic material will be thrown out. In my first operation for harelip, I drew the ligatures very tightly, in order to adapt the edges very accurately. In twenty-four hours the child was seized with trismus and tetanus, and the needles, of course, had to be removed as quickly as possible. The trismus then disappeared, but the success of the operation was frustrated.

After from forty-eight to sixty hours, the needles, which should have been previously brushed over with a little oil, may be removed; the twisted suture may remain adherent for some time longer. In double harelip, with large central piece, an attempt should be made to save it. In cleft palate, where frequently one border of the notch is shorter than its fellow, a curved incision should be made on the shorter one, by which the borders of the wound will become equal in length.

Even when the operation has been entirely successful, in the course of time, a cicatricial contraction and a visible notching of the upper lip result. The success of this operation is of the utmost importance for the future shaping of the cleft palate. The united upper lip then constantly acts as a mild truss upon the fissured upper jaws, approximates them more and more to each other, till they finally touch, when the mucous membrane, by mild cauterization, or by baring the edges with a knife, may be brought to a union.

(2.) CONSTRICTION OF THE MOUTH—*Microstoma* (from μικρός, small, and στόμα, mouth).—An exceedingly rare affection. Some children come into the world either with a very small mouth or with completely united lips, in which latter case it is of itself understood that an operation for the formation of the mouth must be undertaken in the very first hours of life. A more frequent occurrence is contraction of the mouth from syphilitic mucous patches, and chancres. The cicatrices contract more and more, till, finally, it is impossible to introduce a small spoon, or even a tube. If the syphilis has been eradicated from the system by a mercurial treatment, the formation of the mouth may be undertaken according to *Diffenbach's* method. A myrtle-leaf-like piece of skin is excised from the cicatrix, at both sides of the constricted mouth, without injuring the mucous membrane, thus forming the future angles of the mouth; next the mucous membrane is cut through with the scissors clear to the angles, is lapped over the edges of the wound, and united to the outer border by sutures. If the subjects are not marasmic, which, however, is their usual lot after they have surmounted syphilis, the operation will readily succeed. In the contrary case, the mucous membrane will not heal, but becomes covered with an aphthous membrane, and the patients perish in an atrophic state.

(3.) IMPERFECT DEVELOPMENT OF THE TONGUE (*Defectus Linguæ*).—Instead of the normal oval form, the tongue occasionally displays an indentation at the apex, or even a more extensive fissure. Complete splitting of the tongue, where two movable tubercles or bands are seen at the back of the mouth, is very rarely observed. Children thus affected, according to *Bednar*, are able to cry, and the sense of taste is said to be present. According to embryology, this malformation is explainable in the following manner: The development of the tongue proceeds from the first visceral arch. When the bulbous ends of the visceral arch meet in the median line, and become united to each other, a small tubercle is seen to develop itself on the lower border of the posterior surface of the first gill-arch, at the place of union of the two halves, which at first has a triangular, later an oval form, and gradually becomes developed into an anteriorly-curved, fleshy cone (the tongue). But, if this union of the visceral arch did not take place perfectly, and at the right time, that fleshy cone will remain divided, and, as an effect thereof, is retarded in its general development.

(4.) HYPERTROPHY AND PROLAPSE OF THE TONGUE (*Prolapsus Linguæ*).—The tip of the tongue only is seen protruding beyond the lips at birth; the protruding piece, however, if nothing is done, will increase in size from day to day. Such children are unable to suck, and also hindered in swallowing, for the tongue not only hypertrophies anteriorly, but also in width and thickness. This enlargement of the tongue is usually combined with cretinism. When the dentition period arrives, the incisors are prevented from assuming their perpendicular position, and are directed obliquely forward. The constant pressure of the teeth produces an intense infiltration of the tongue: it ulcerates, becomes furrowed, the saliva constantly flows down over it, undergoes decomposition, and diffuses a disgusting, sour, rancid, fatty smell. In cases of many years' duration, the inferior maxilla forms a gutter, in which the ulcerated or dry tongue lies. The lower lip becomes everted, and the acquisition of distinct speech is wholly impossible. This condition is also met with in children well-developed in other respects, who have frequently suffered from convulsions, by which a weakness or partial paralysis of some of the muscles of the tongue may remain.

Treatment.—If the evil is recent, and the tongue reducible, the cure is soon effected by dusting powdered alum on the protruded part, or painting it with tr. amara. But, when the tongue cannot be reduced in this manner, and the mucous membrane is already ulcerated and fissured, the projecting piece will have to be removed by a surgical operation. Hitherto, the ligature or knife was employed in this operation; in most instances it is now performed with the écraseur, but most quickly and elegantly with the galvano-caustic apparatus.

(5.) ABNORMAL ADHESIONS OF THE TONGUE (*Adhæsio Linguæ*).—There are cases in which the frænum is short, and yet inserted very far anteriorly at the tip of the tongue, by which that organ is much hindered in its motions, especially in its protrusions, and in sucking.

Tubercles in and hypertrophies of the frænum also occasionally occur, and exercise the same effect upon the tongue. Fræni, which are so constructed, must be severed by the snip of a scissors, if the sucking has actually been interfered with; this, however, is usually not the case. The frænum is divided hundreds of times where it is once really indicated. But, as this operation, when performed by a steady hand, is totally devoid of harm, it is therefore not necessary to look so strictly for the indications, especially if any comfort can thereby be conferred upon the patients. This little operation is performed in the following manner: The head of the child, facing the window, is held by some person, while the surgeon pushes the index-finger of his left hand under the tongue, close by the frænum, makes the latter a little tense, and cuts it through with a curved Cooper's scissors as far as it is membranous. The hæmorrhage soon ceases.

But, in addition to this shortening of the frænum, there also occurs an actual union of the whole lower surface of the tongue on all sides with the floor of the mouth, either congenital, as a continuation of the embryonic union of the tongue with the floor of the mouth, of which the normal superfluity of the folds of mucous membrane on both sides of the frænulum represents the so-called plica fimbriata, or acquired through syphilitic or mercurial ulcerations. Fortunately, this is a tolerably rare occurrence. The separation of the entire tongue with the knife is a very bloody operation, and often leads to no satisfactory results, if the after-treatment, consisting in the constant introduction of pledgets of lint, and frequent passive motion of the tongue, is not assiduously carried out. The galvano-caustic promises better results.

(6.) RANULA.—By ranula, frog-swelling, we understand a cystic tumor with fluid contents, found beneath the tongue on the floor of the mouth. It occurs on one or both sides of the frænulum linguæ, its size varies between that of a pea and a pigeon's egg; in the latter case, it may also be felt externally beneath the chin. The mucous membrane covering it is often so atrophied that the walls of the cyst lie freely exposed. In other cases, the tumor lies much deeper on the anterior and lateral parts of the neck under the mylohyoid muscle. The effects of this evil vary according to its size. So long as the tumor is not larger than a pea, it gives rise to no phenomenon. But, as it increases in size, it compresses the tongue against the hard palate, and then sucking, swallowing, and breathing, are rendered difficult. In the most intense form of this evil, attacks of suffocation ensue which have some resemblance to those of croup. It is generally supposed that this affection can only be cured by a surgical operation; but a spontaneous cure may also take place by suppurative degeneration of the cyst and its adjacent structures; of this, the following case taught me:

A mother rushed breathless into my office, with a boy one and a half years old in her arms. She related that he had always been well, but of late had a peculiar rattling in the throat during sleep, and, for the last eight days, attacks of suffocation, which, according to her ideas, had some connection with the dentition, because he was suffering from profuse ptyalism, and often put his hand into the mouth. While the woman was making these statements, I commenced to examine the child. The forehead was hot, the pulse very rapid, the respirations loud, like those of croup, the expression of the face anxious and suffering. As I introduced my finger into the mouth, for the purpose of examining the pharynx and tonsils, he was seized with a sudden fit of choking, and, as I, on that account, depressed the tongue, I felt something burst, and the size of the tongue instantly decreased. At the same time, a tolerably large quantity of muco-purulent fluid flowed alongside of my hand from the floor of the mouth, which had its source in the ruptured cyst beneath the tongue. I thoroughly cauterized the collapsed cyst with lunar caustic, and it became converted into an obstinate ulcer, which healed, only after many months, with a white cicatrix.

Various theories are entertained in regard to the nature of ranula. Aside from the somewhat too keen theory of old *Paré*, who considered it "as cold, moist, gelatinous matter derived from the brain, and transplanted to the tongue," it is looked upon by some as a cystic swelling of unknown origin; while others regard it as an occlusion, and subsequent distention of the duct of the submaxillary gland, the ductus Whartonianus. This latter theory, suggested by *Munincks*, and adopted by many others, has too serious grounds against it to retain any further value. *A priori* reasoning would favor this supposition; it finds a justifiable analogy in the dacryocystoblennostatis, but chemical investigations have shown that the fluid of the ranula is not saliva, for albumen is found in it, which does not exist in saliva, while rhodium-kali, characteristic of the latter, is here totally absent. The reply, that the chemical synthesis may not be able to produce the exact proportions, because the saliva, long confined, may take up new chemical bodies, and, by exosmosis, give off primitive ones, is made invalid by the anatomical knife. According to *Hyrtl*, ranula has already been found *near* the healthy undilated salivary duct. Ranula, consequently, is no dilated ductus Whartonianus, but a cyst; and, since, according to *Fleischmann*, a mucous bursa exists under the tongue, it is probably a dropsical mucous bursa, or ganglion.

The prognosis, according to these anatomical conditions, and also in conformity with experience, is not unfavorable, chiefly because the diseased parts are within easy reach.

Treatment.—It consists in the removal of the anterior part of the cyst, and frequently-repeated cauterizations of the opened cavity with a solid stick of nitrate of silver. A simple incision into the cyst and evacuation of its contents do not answer, because the cyst is very prone to close up again; this is still more promoted by the pressure of the superlying tongue. A very torpid ulcer results from the cavity that is thus exposed, which does not close up until it has been repeatedly and intensely cauterized.

(7.) CATARRHAL INFLAMMATION OF THE MUCOUS MEMBRANE OF THE MOUTH (*Stomatitis Catarrhalis*). **Symptoms.**—By catarrhal stomatitis are meant redness and augmented secretion of the mucous membrane of the mouth. On those places of the mucous membrane which have a feeble and rich substratum of connective tissue, the redness attains to a much higher degree than on those which lie directly over the bone, for example, on the hard palate, where it is generally but slightly increased. It is most intense on the tongue, which has the appearance as if it were covered over by a thick coating of raspberry syrup. When the process lasts long, the tongue becomes covered with a white fur. In fact, even œdema of the mucous membrane supervenes here; it is, however, so slight, that it produces no change in the form of the cheek and lips, as is the case, for instance, in stomacace.

The pain is here very distinctly marked. The patients suck unwillingly; partake on the whole of but very little, and only cold nutriments, and do not allow their mouths to be felt with the finger. As this stomatitis catarrhalis is but very seldom idiopathic, and generally the accompaniment of other, in greater part febrile processes, it is difficult to determine its influence upon the general state of the system. Nervous children are also feverish in simple stomatitis, although unaffected by any other disease. When the inflammation of the mucous membrane of the mouth extends over the larynx, nasal passages, the Eustachian tube, and tympanum, it produces the well-known phenomena of catarrhal laryngitis, coryza, catarrh of the Eustachian tube and of the tympanum, any one of which suffices to induce febrile excitement. The pain, during nursing and drinking, at times is so great, that children will partake of scarcely any nutriment for days; nutrition and development are thus totally interfered with.

The secretion of such a morbidly-changed mucous membrane is always augmented, the saliva constantly flows out at the corners of the mouth, corrodes them, reddens the chin, and soaks through the garments. This saliva does indeed smell somewhat acid, and reacts also feebly acid; it never, however, has that disgusting odor which is perceived in actual suppurations of the mucous membrane.

If the redness and painfulness have existed for some time, and the cause still continues, clear, minute water-vesicles, like true exudations, will rise upon the tongue, gums, mucous membrane of the lips and cheeks, which in appearance and course have many similarities to herpes labialis. They burst very soon, and leave behind them small, flat ulcers, with yellowish-white bases, which, in the first few days, increase in every direction, become confluent, and thus present tolerably extensive ulcerated surfaces, especially on the edges of the tongue and on the mucous membrane of the lips—stomatitis ulcerosa.—These minute vesicles, like almost all diseases of the mouth, have been called "aphthæ," a term that has produced so much confusion, in the description of the diseases of the mouth, that it seems advisable to discard it altogether.

After these ulcers have continued to increase in size for several days, and produced severe pain when touched, the yellowish color of their bases disappears; they become red, and covered as it seems directly with epithelium; at any rate, the recovery takes place so rapidly, often in two or three days, that a cure by cicatrization, and contraction, is not supposable.

These ulcers never diffuse any particular odor. The breath of those affected with it smells only slightly acidulous, never nauseating, as in stomacace.

The most common *cause* is the eruption of the teeth. During this process stomatitis occurs so regularly, that it must be regarded as physiological. A further frequent cause is to be found in the sucking-rag with its fermenting contents. In older children, too hot or too cold nutriments, carious teeth, spiced, irritating victuals, in some children antimonial and iodine preparations, may also give rise to this affection. It also occurs in small epidemics, chiefly in summer, caused perhaps by the immoderate indulgence in sour fruits; and, in addition, is also the accompaniment of many febrile diseases, especially of the acute exanthemata.

Treatment.—The treatment is extremely simple. The causes, the sugar-teat, etc., are removed as well as possible, the chest is protected against getting wet by a piece of oil-silk which is secured under the jacket, and the infants are only allowed to drink cow's milk with water.

It is advisable, on account of the profusely secreted saliva rapidly becoming sour, to cleanse the mouth every hour with a feebly alkaline solution; for instance, borax ℈j, to water ℥j. The painful ulcers may be relieved for many hours, and even permanently, by cauterizing them with the solid nitrate of silver. In idiopathic stomatitis spontaneous recovery takes place in eight, at the longest fourteen days. Symptomatic stomatitis in febrile diseases is not usually a subject of special treatment.

(8.) Diphtheritis of the Mouth (from διφθέρα, skin, and *itis*).—By diphtheritis or diphtheria, angina membranacea, angina couenneuse of the French, is understood an acute general affection, the most striking symptoms of which consist in an *extensive formation of membranes on the posterior parts of the mouth.*

Historical investigations have shown that the disease is by no means new, and that it was already known to *Aretæus* (second half of the first century A. D.). There are also descriptions extant of epidemics in Holland (fourth century), in Paris (sixteenth century), in Spain (seventeenth century), and in the present century it occurred most frequently in America, next in England and France, and lastly in Germany, and indeed predominantly in the northern part thereof.

A *primary* and a *secondary* diphtheria are distinguished, of which the latter associates itself particularly with measles and scarlet fever, and occurs in a sporadic form, whereas the primary almost unexceptionally prevails epidemically, and is decidedly contagious.

Symptoms. — Primary diphtheria invariably begins with fever, marked acceleration of the pulse, increase of temperature of the skin, and general depression. Still, these phenomena in different individuals are extremely unequally developed ; this inequality, in fact, is only a special peculiarity of this disease, since its occurrence and course, under equal circumstances and in equal ages, vary immensely.

The local symptoms make their appearance after these general phenomena have existed for a few hours, or at the longest one or two days. The patients are attacked by dysphagia, a snuffling, somewhat hoarse voice, and stiffness of the neck; the first two symptoms are due to the diphtheritic exudation coating the tonsils, palate, and nares, the last to the *never-absent swelling* of the adjacent lymphatic glands of the neck.

If the mouth is now examined by the aid of a good light, it will be seen that the mucous membrane of the lips, gums, cheeks, and of the hard palate, is perfectly intact, but that the soft palate, the tonsils, and the posterior wall of the pharynx, are covered with a white membrane, which, especially upon the tonsils, may attain to one-half and even one line in thickness. The color of this membrane at first is perfectly white, but after several days it passes over into a yellowish-white or grayish-white tint. If the affected parts have been injured by escharotics or rough handling, small hæmorrhages ensue, in consequence of which the membranes assume a brownish or even blackish color. The course of these membranous formations varies according to the character of the epidemic. There are instances where the membranes have been cast off in two or three days, and the mucous membrane beneath was seen to be uninjured; there are other cases, and these form the generality, where the membranes exist for two and three weeks, the mucous membrane is thereby drawn into a process of ulceration, and heals only after a protracted period, with visible cicatrices; and finally malignant cases occur, in which gangrene soon manifests itself, followed by general collapse, the mucous membrane undergoing a black destructive degeneration. In this last unfavorable form, marked destruction of tissue takes place, usually quickly followed by death, and a recovery is but very rarely brought about.

If the membranes can be seen upon the places mentioned, then, of course, no doubt can be entertained in regard to the diagnosis. But in some particular cases a redness and slight swelling of the fauces only are noticeable, and yet all the subjective and the rest of the objective symptoms of diphtheria may be present. Here we have to deal with an exudation upon the *posterior* surfaces of the uvula, soft palate, and of the nasal cavities, as may be demonstrated by elevating the soft palate with a forceps, certainly accomplishable only in adults, and by the discharge of a profuse *reddish-colored mucus* from the nares. I have often convinced myself, at the *post-mortem* examination, that the anterior surface of the soft palate may remain perfectly free, while the posterior, on the contrary, may become coated with membrane. By far the most dangerous, and, in some epidemics, unfortunately also the most frequent phenomenon, is the extension of the membrane into the *larynx*, which will be treated of more minutely further on, in the chapter on croup.

Diphtheria is no *local* disease, for otherwise the vagina, excoriated surfaces on various parts of the body, the conjunctivæ, and sometimes also the anus, would not become simultaneously coated with false membranes.

The most common complications and sequelæ to be mentioned are *albuminuria* and *nephritis*, *croup*, *bronchitis*, and *pneumonia*, *intestinal catarrh*, *myocarditis*, and finally a peculiar *paralysis*.

Albuminuria is said to have been observed, in severe epidemics, from the very commencement of the disease; in the ordinary epidemics, such a one as I witnessed in Munich in 1864, the urine at first is free from albumen, dark in color, and sparingly secreted. But later on, when the diphtheria has completely exhausted itself, a true nephritis occasionally supervenes, which, so far as the morbid changes in the urine are concerned, cannot in any way be distinguished from nephritis occurring after scarlatina. The urine has a blood-red color, contains a large quantity of blood-globules, epithelium cells and casts, and, on boiling, reveals a correspondingly large precipitate of albumen. But whereas in nephritis, after scarlet fever, anasarca and effusion of serum into the serous cavities, rapidly and in a critically high degree, take place, here, as a rule, the extremities do not swell, and dropsical effusions into the large serous sacs are still more rarely met with. Usually, this nephritis terminates in recovery, but for it we often have to wait many months, and it does not occur until an alarming general emaciation has set in, attended by a gradual decrease of the albumen. The absence of dropsy is most readily explained by the fact that in scarlatina both kidneys are almost always affected; in diphtheria probably only one is implicated, while the other remains in a normal condition.

Bronchitis and *pneumonia*, as complications of diphtheria, will be more advantageously spoken of in connection with croup.

Myocarditis, molecular degeneration of the cardiac muscle, is a tolerably regular pathological condition found in cases of sudden death, and occurs more or less frequently in every severe epidemic.

Intestinal catarrh, during and after diphtheria, in small children who are still laboring under dentition difficulties, is often of a very protracted duration, and, conjointly with the increasing anæmia, frequently leads to death.

The diphtheritic *paralysis* is of an extremely peculiar nature; its connection with diphtheria has been pointed out by *Orillard* only within the last decade. As regards the frequency of this phenomenon, it is extremely variable in different epidemics. In some epidemics almost all convalescents are said to manifest symptoms of paralysis; in others, again, for example in the one I witnessed, but a small number were so affected. The time of its occurrence happens mostly in the third or fourth week from the invasion of the disease, not often before; sometimes, however, much later, so that its subjects may seem to have enjoyed perfect health for from six to eight weeks, and still be liable to be attacked by paralysis. It begins almost invariably at the *palate*. The children suddenly get an indistinct snuffling speech, as is witnessed in persons with congenital or syphilitic-acquired defect of the palate, and the gutturals in particular are pronounced with extreme difficulty. At the same time embarrassed deglutition ensues, and a part of the swallowed drinks, with or without a spasmodic cough, flows out at the nose. In most cases the paralysis remains confined to this small space; the general condition of the system, with the exception of a remarkable bloodlessness, is not perturbed, and the complication usually terminates in sudden recovery after several weeks. The prognosis assumes a far worse aspect when the extremities also become paralyzed, and in paralysis of the muscles of the body death usually ensues in consequence of the laborious, difficult, and imperfect respirations. Paralysis of the extremities occurs more frequently in the lower than in the upper, in most instances is bilateral, and is in no way to be distinguished from that occurring after typhus or scarlet fever.

Lastly, the *diphtheritic amaurosis* is also remarkable. The loss of sight is not complete, but consists only in a diminution or weakness of vision, smaller objects not being distinctly perceived. Ophthalmoscopically, no constant morbid changes can be demonstrated, and specialists, according to the precepts of *Donder*, assume the existence of a paralysis of the sphincter iridis, and of the tensor choroideæ muscles. This evil, as a rule, also disappears completely in a few weeks. Relapses of all of these paralytic symptoms have been observed, but seem to be very rare.

Pathological Anatomy.—The essential anatomo-pathological condition seems to be the existence of false membranes, which most frequently occur on the posterior parts of the mouth, pharynx, and larynx. They are usually yellowish white, but in the cadaver, especially where the mouth has been open, they soon become darker, brown, or blackish, as a result of desiccation. Sometimes they can be removed with ease, at other times with difficulty, from the subjacent mucous membrane, and the latter, as a rule, displays no loss of substance, only a diminution of its natural gloss. The microscopic examination of these membranes furnishes few important facts. They consist in greater part of granules and cells, solitary epithelium-cells, and striæ of fibrine. The morbid changes in the larynx and lungs will be described further on.

Treatment.—The most varying, totally antagonistic views prevail concerning the treatment of diphtheria, from which alone it follows that all the remedies hitherto employed are of doubtful efficacy. Since the site of the disease is within easy reach of hand and eye, a local treatment has always been recommended and persisted in. There is no escharotic that has not already been tried in this disease. Of this class of agents, nitrate of silver and muriatic acid have acquired the greatest reputation. Of late, some very eminent English physicians have abandoned these escharotics altogether, and found that the result of their treatment is by no means less favorable; on the contrary, even somewhat better. In view of these considerations, I have for the last two years totally abandoned the cauterizing treatment, and by hundreds of cases convinced myself of the correctness of those statements. I may declare with a perfectly clear conscience, and to the satisfaction of the numerous tormented diphtheritic children, that cauterization with the substances hitherto used has *no* favorable influence upon the local affection. In somewhat older patients, say up to five years of age, I prescribe the inhalation of pure lime-water five to six times daily for at least five minutes at a time, by the now very simplified *pulverisateur*, and have derived remarkably good results from this mild and considerate treatment, to which children of this age may by kindness be induced to submit. Internally, for many years past, I have given nothing but chlorate of potassa: to children under one year, ℈ss—℈i; of one to three years, ʒss; of three to five, ℈ij; to still older ones, ʒi, in twenty-four hours, dissolved in several ounces of water. When diarrhœa or great restlessness is present, an appropriate dose of opium or morphine may be added with advantage. Carbonate of soda, in quantities of ʒi *pro die*, praised so much by the French as a specific for this disease, has not proved itself as such in this country, and is really far inferior in its effects to the chlorate of potassa. When the strength begins to fail, the system should be supported by wine, quinine, camphor, castoreum, etc. For the treatment of diphtheritic croup, see further on under diseases of the larynx.

(9.) Putrid Sore Mouth (*Stomacace*).—I have never yet had an opportunity to see the commencement of stomacace, and consequently can neither indorse nor contradict the assertions of authors, according to which a catarrhal stomacace is present at first. Stomacace that is already fully developed—for only against this is medical assistance usually sought—is attended by the following symptoms:

The borders of the gums in some places are yellow, coated with a thin layer of yellow mucus and their sharp margins have disappeared, owing to which the teeth seem to be a little larger than before. The slightest touch on such a gum causes bleeding of the ulcerated places. Notwithstanding the slight amount of space involved in the ulcerative process, the affection can be recognized at a distance of many inches by the sense of smell. *Stomacace always emits a peculiar fetid smell*, and it is by the aid of this odor that we are able to differentiate it with ease and certainty from the higher stage of catarrhal stomatitis, where, after the minute vesicles have burst, small, flat, yellow ulcers also take place.

In this, the first degree of stomacace, the mucous membrane of the mouth is but slightly swollen, and its secretion not materially increased.

In the second higher grade, the parts lying in contact with the gums become immediately infected and undergo the same morbid changes as the gums. The mucous membrane of the cheeks swells up intensely, so that the impression of the individual teeth is very distinctly seen upon it; so also the mucous membrane of the tongue, which upon its upper surface is covered with a white fur, and its borders exhibit the dental impressions. Pl. III., Fig. 1, represents the contour of such a tongue. Also its whole periphery, in consequence of the swelling and compression by the upper and lower rows of teeth, becomes sharply angular. The same kind of yellow ulcerations now form on the cheeks, lips, and tongue, as were originally only present upon the gums. The swelling rapidly increases. As a result of this the patients are no longer able to shut the mouth, they keep not only the lips open but also the jaws, in order to prevent the touching and friction of the extremely painful ulcers, and a brownish-red, foul-smelling saliva flows down in large quantities over the swollen lower lip. Here, too, the cervical glands become painful and swollen almost as regularly as in diphtheritic oris. I have never yet observed membranes to form upon the ulcers. This disease has but a slight tendency to heal spontaneously; the œdema, the ulceration, and the fetor, may remain untreated for months, the teeth then become loose and fall out, and the children seriously emaciated. Finally, after a long time, spontaneous healing seems to ensue.

Mastication, deglutition, and speaking, in the more serious form, become almost altogether impossible; the patients will not drink for a long time, till the thirst becomes insupportable, and then they will consume large quantities of cold water or cold milk at a draught, under evident pains. In older children fever does not usually come on; the pain, however, at every movement of the mouth, and particularly on swallowing, makes them ill-humored in the highest degree.

The etiology is a manifold one. The contagiousness of the disease may be very clearly and explicitly demonstrated. Some of the children of a family or neighbors upon the school-benches very readily impart it to the rest. A stage of incubation, as in the exanthemata, does not seem to exist, if at all, but for a very short time; at any rate, I have always noticed it to appear tolerably simultaneously in many families. Moreover, it may also originate *spontaneously* in children as in adults, for which carious teeth are the predisposing agents; and, finally, there is a disease of the mouth in small children, produced by *calomel*, which can in no way be distinguished from the stomacace just described; it is then that the absence of the properties of infection of the so-called stomatitis mercurialis becomes valuable as a differential sign.

Diseases of the mucous membrane of the mouth, caused by mercury, occur in children less frequently and much later than in adults. I have never yet seen stomacace to supervene as a result of the external application of mercury in the form of blue ointment, although I have used it for the last three years in all syphilitic children, whenever the state of the skin allowed. In small children, salivation is an extremely rare phenomenon.

Treatment.—We are so fortunate as to possess but *one* remedy for stomacace, and that is *chlorate of potassa*, *kali chloricum*. To children under one year of age, I give ℈j daily; under two years, ʒss; under three, ℈ij: children who have attained the fourth year tolerate very well ʒj *pro die*. The various quantities are always dissolved in four ounces of water, sweetened with a little syrup, and administered in from twelve to eighteen hours. After the end of this time, the smell, in all cases and in every degree of stomacace, is *completely abolished*. In cases of less extensive ulceration, a recovery instantly takes place, the gums become firm, the yellow border is cast off, touching with the finger no longer causes bleeding, and the patients are again able to masticate and speak without pain. Even in the more severe form, the use of chlorate of potassa for one day will suffice to annihilate the odor completely, but, if the remedy is not continued for three or four days, it will return, and the disease progress anew. I have never yet employed this remedy longer than four days in any one case, and have never been able to perceive from it any bad effects, such as diarrhœa, loss of appetite, abdominal pains, renal troubles, etc., notwithstanding the hundreds of times that I have employed it, and therefore have not prevailed upon myself to use it as gargle, instead of administering it internally, especially since small children are such poor adepts at gargling, and even the larger ones can only with difficulty be induced to do it. It is entirely unnecessary to cauterize the ulcers on the cheeks and gums which are devoid of smell, and are no longer painful, for the cure progresses extremely rapidly without it. Formerly it was supposed to be necessary to extract all the carious teeth, of which a number are often found in children, before the commencement of the second dentition, in order that a cure might take place. It is, however, entirely unnecessary, and even directly injurious, for the lacerated borders of the gums in the vicinity of the extracted teeth immediately become affected by the stomacace, and the pain and suppurating surfaces are thereby only increased. Alocal treatment, besides the internal administration of chlorate of potassa, is altogether superfluous.

(10.) SCORBUTIC INFLAMMATION OF THE MUCOUS MEMBRANE OF THE MOUTH.—By scorbutus we understand a diffused disease of the capillaries, which burst at various places, and, according to the extent of the solutions of continuity, allow larger or smaller quantities of blood to be extravasated into the surrounding textures. Whether the chemical quality of the blood is at fault here is not ascertainable; this much, however, is known, the fibrine of the scorbutic blood coagulates slower than that of the normal.

Now, these hæmorrhages in the mouth take place in such a characteristic manner, that the existence and degree of the scorbutus may be inferred from them alone.

I can only make some allusions to the land-scurvy from my own experience; how children are affected by the sea-scurvy is beyond my means of determining. A healthy, well-nourished child, in a good dwelling, never becomes scorbutic. Among the more affluent classes it is only seen as a sequela of severe, protracted diseases, especially typhus abdominalis; among the poorer classes, whole families become scorbutic from living in damp houses and existing upon poor and insufficient food.

Symptoms.—Paleness, loss of flesh, sadness, or a protracted typhus fever, usually precedes, for a long time, the breaking out of the scorbutus. Then the gums begin to be painful on mastication, and are greatly inclined to bleed. The external border of the gums lies no longer in close contact with the teeth; it is somewhat swollen and of a bluish-red color, and at some places abrasions of the mucous membrane are seen.

The rest of the mucous membrane on the hard palate and cheeks is *not* affected by catarrhal stomatitis—it is only pale and anæmic. Here also the fetor of the mouth is tolerably intense, nevertheless it can be distinctly distinguished from that of stomacace.

When the process lasts for a long period, the entire border of the gum will present the appearance of a single, bluish-red extuberation, covered with small excrescences, and bleed at the slightest touch. The teeth are coated with a yellow mucus; a brownish, fetid saliva flows from the mouth; large and small ecchymoses now appear upon the mucous membrane of the tongue, cheeks, and lips; at some places they are absorbed, at others however, they become ruptured, and then display fungous ulcers with readily-bleeding bases. Under favorable circumstances all these morbid lesions pass through a retrograde metamorphosis, though only very slowly, it is true, and the gums retain their disposition to bleed for a long time. But if the unfavorable causes continue, then all the scorbutic symptoms become aggravated, the teeth fall out, whole pieces of the gums are cast off, the ecchymotic lower extremities become œdematous, general dropsy supervenes, and the children perish with anæmia.

Therapeutics.—The treatment of idiopathic scurvy, that has originated through impoverished circumstances only, is very simple, if it is possible to improve these conditions; that is, to put these children in a dry, well-ventilated room, and to procure for them cleanliness, care, and good attention, and in part animal food. In the contrary case, all the highly-eulogized remedies will fail us. True, recoveries also occur here, especially in the warm seasons of the year, when the patients are at least able to enjoy the fresh air on the streets. Lemon-juice, or some kind of vegetable acid, is everywhere recommended as the most useful remedy. The affection of the mouth is readily subjugated by astringent gargles, composed of alum, tannin, rhatania, catechu, etc., to which a few drops of the tincture of myrrh may be added with advantage. Profuse hæmorrhage must be arrested by liq. ferri sesquichlor., or by cauterization with lunar caustic or concentrated muriatic acid. When gangrenous destruction sets in, the powers of the system should be supported by wine, quinine, tonics, and good diet. Scorbutus, after typhus fever, is one of the most disagreeable complications of that disease. Owing to the great prostration of the functions of absorption, all methods of nourishment, as a rule, prove futile.

(11.) Noma (from νομή, corroding ulcer).—By noma, cancer aquaticus (Wasserkrebs), gangræna oris, stomato-necrosis, a gangrene of the cheeks is understood, which makes its appearance under such constant and peculiar phenomena that it demands a separate description and classification as a special kind of gangrene. The older writers on medicine do not seem to have been acquainted with it; the first work upon this subject is by *Battus*, a Dutch physician, at the commencement of the seventeenth century.

Noma occurs almost invariably in children between the ages of two and twelve years. Nurslings seem to be entirely exempt from it. Adults, too, are but extremely rarely attacked by it; many physicians have never seen it in the latter. A protracted febrile disease, scarlatina, measles, or typhus fever, always precedes the noma, and no instance is known of a previously perfectly healthy child becoming affected by it. It does not occur in an epidemic form; it is asserted that it never appears in the southern countries; it seems most frequently to prevail in Holland; girls are oftener attacked by it than boys, and almost always only one-half of the face is implicated.

Symptoms.—Noma is always situated in the cheek, and most frequently on that part thereof lying adjacent to the angle of the mouth. I have only once seen an acute gangrene originate in the deeper structures beneath the lobe of the ear, which, like the ordinary noma, quickly spread through the deeper structures of the parotid, and laterally over the cheek, neck, and lobe of the ear, and in a few days brought about a lethal end. Usually, a child convalescing in the very best manner presents a tolerably distinct, circumscribed, indurated spot on the cheek near the angle of the mouth, which causes no very great amount of pain. On inspecting the mouth, a serous vesicle is seen only exceptionally opposite the induration; usually it is ruptured, and the mucous membrane has undergone a brownish-black, shreddy decomposition.

The cheek swells up, and the adjacent glands of the neck become infiltrated. The integument of the cheek is pale, waxy, and glistening, and the portion covering the place of the first induration, opposite to the internal disorganization, turns blue, the epidermis becomes flaccid, is detached with the utmost ease, or falls off of its own accord, and now it is seen that the gangrene, progressing from within outward, has reached the skin. At first, the gangrenous part of the cheek is barely of the size of a nickel penny, and contracts by desiccation, then a brownish-red furrow forms between the living and mortified skin, and this furrow extends peripherally more and more, so that the gangrenous part may be seen to increase in circumference from hour to hour. The gangrene extends further and further, till in some cases the entire cheek up to the eye, to the ear, and to the cervical region, has become involved, and the patient presents a disgusting picture of horribly-destructive disease. The noma does not merely extend externally, but it also attacks the bones of the jaws; the upper (sometimes also the lower) maxilla rapidly becomes necrotic, the teeth fall out, and after a few days the necrosis is so complete that large pieces of bone may be removed with the dressing-forceps. A fetid sero-sanguinolent ichor flows from the irregular, ulcerated, sloughing surface, which is but little sensitive. The borders of the sound parts are reddened, several serous vesicles sometimes form upon the apparently still healthy cheek, at a distance of a few lines from the gangrenous spot, the subjacent tissues rapidly mortify, and the borders of the new and of the old ulcers approximate each other closer and closer, till they finally form one large gangrenous, phagedenic surface. On examining this mortified part, a large quantity of free fat will be found mixed with traces of muscle, the nerves are yellowish white, and the blood-vessels are filled with thrombi. The thrombi seem to have formed very early in the disease, and in a very severe degree; for hæmorrhages are extraordinarily rare occurrences here. This intensely destructive process runs its course in from three to six days.

The general phenomena and fever are, at first, insignificant, and appear only as consequences of the local destruction and purulent absorption; soon, however, diarrhœa of a colliquative nature comes on, syncope, sopor, or delirium, becomes superadded, and the feet, as a finale, become œdematous. At the autopsy, we generally find, in addition, lobular pneumonia, which, during life, on account of the extreme prostration of the whole organism, manifested but few objective and subjective symptoms. Noma is easily diagnosticated. It is differentiated from all other kinds of stomatitis by the rapidity with which the external structures become involved, and the rapid spreading of the gangrene. The prognosis is very bad. Out of five cases that came under my observation, one only recovered, and that, too, with a frightfully-disfigured nose and cheek, which were only partly remedied by several plastic operations, but not without great distortion of the adjacent parts. According to a compilation by *Tourdes*, sixty-three out of two hundred and thirty-eight cases recovered.

Treatment.—Chlorate of potassa may also be given in this disease, with the object of ameliorating the fetor, in the same manner as recommended in stomacace. Here, however, the effects of this remedy are not so brilliant; the gangrene keeps on progressing, and the odor is but slightly diminished. In order to abate it as much as possible, it is necessary to bathe the children daily, and to change their garments often, because they constantly wipe their ichorous, soiled hands upon them. An attempt must be made to arrest the progress of the gangrene by cauterizing the healthy parts contiguous to it. Concentrated muriatic acid, with which the whole border of the noma, internally and externally, should be pencilled over two or three times daily, seems to be the most appropriate escharotic. The child should be firmly held by an assistant, for the pain is very severe, and all the superfluous acid on the surface of the mucous membrane of the noma should be wiped away with a small sponge. In this manner it is possible, in some cases, to keep the evil within bounds. In most cases, however, the gangrene progresses unrestrained, and the patients perish in from two to fourteen days with the above-described symptoms. Not much can be accomplished with a stimulating treatment of wine, decoct. cinchonæ, eggs, etc., for usually it is impossible to induce them to partake of such nutriments; milk or coffee is about the only article of diet for which they have any relish, of which as much as possible should be administered to them.

(12.) THRUSH.—By thrush, sprue, soor (Mehlmund, Mundsöhr), muguet, blanchet, of the French, aphthæ, stomatitis cremosa, aphthophyta, by all these different designations only one process is understood, namely, the formation of white membranes in the mouth, which, microscopically, consist (1.) Of a granular mass, (2.) Of basement epithelium, and (3.) Of fungi in their various stages of development. (Pl. III., Fig. 2.) *Robin* has called this fungus oïdium albicans. The views of the different authors on the nature of this disease vary in many respects, at the present day, although it occurs extremely often, and almost daily presents itself for examination to every physician, and although the mouth is accessible to all the senses.

Thrush attacks, by preference, infants in the first months of life, but in some instances it has also been observed in children one or more years old; in addition, also, in cachectic adult individuals, and especially tuberculous and carcinomatous patients.

Symptoms.—At first the natural bright-red color of the mouth becomes altered, a livid, dark-red color takes its place; the entire mucous membrane appears as if a thick layer of raspberry syrup had been smeared upon it. *This change of color never occurs in the form of spots or islands*, but is uniformly diffused over the entire cavity of the mouth. Only on the hard palate, where the mucous membrane is firmly adherent to the bone, and on the border of the lower jaw, where the teeth which are near breaking through cause a marked tension and attenuation of the super-lying mucous membrane, no such decided dilatation of the capillaries can take place, and it is on that account that the redness is less developed there; sometimes there is a marked contrast between the entire yellowish-red hard palate and the rest of the livid-red mucous membrane. The tongue is darkest in color, and its papillæ, particularly those at its margins, are a little more prominent than usual. The temperature of the mouth, according to the sense of touch, is slightly increased; no exact thermometric measurements can be obtained in children. The mouth, at the same time, becomes painful to the touch, as is apparent from the efforts of the infants to expel every foreign body introduced into it. In the normal state, for example, when a finger is introduced into the mouth, they instantly begin to suck at it; but, when affected with this disease, they will try to remove it by rolling the head from side to side, and will also begin to cry. For the same reason they often stop during nursing, and rest for a while, from the pain to the inflamed mucous membrane, caused by swallowing.

Further on in the disease an anomaly in the secretion of the mouth takes place. The mucous membrane loses its lubricity, feels tenacious, and a piece of filtering paper laid upon it sticks to it; in the normal condition, the filtering-paper does not readily adhere to it. The distinctly acid reaction of the secretion of the mouth, at a time when as yet none but these changes of the mucous membrane can be perceived, is of the highest importance, and supplies an index in judging of the entire morbid process.

In the mouth we have a mixture of two glandular secretions, namely, the secretion of the salivary glands and of the mucous follicles. Pure salivary glandular secretion always reacts alkaline, and, indeed, most distinctly so, immediately after a meal. The secretion of the mucous follicles very soon becomes sour, and this acid reaction is always more distinct when the fresh mucus is allowed to stand, for, owing to the fermentation that takes place, free acid is rapidly generated. We have, then, two diametrically opposite reacting fluids in the mouth, and it will depend upon their quantitative relation to each other, and their degrees of concentration, whether the mixture should possess more of the properties of saliva or of mucus. If a sufficient quantity of alkaline saliva is present, the free acid developing in the mucus is thereby neutralized; if not, a distinctly acid-reacting secretion of the mouth originates.

The tenacious, highly-red mucous membrane, at the commencement of thrush, always reacts acid, even if it has been cleansed in water and not been in contact with any food for a whole hour. If any mucous membrane so constituted is scraped off, and the raspings examined by the microscope, *there is found*, *conjointly with the epithelium*, *a considerable quantity of oval*, *sharply-defined bodies*, *sometimes connected together in twos or threes*, which *are easily recognized as fungous spores.* True, a highly-red, acid-reacting mucous membrane is also met with, where it is not possible to detect upon it any of these spores; I have, however, never succeeded in discovering them upon a normal, pale-red mucous membrane that had been well cleansed in water, and had not been in contact with any food afterward. From this it follows that the disease of the mucous membrane primarily originates without the formation of fungi, and that no fungi ever form upon normal mucous membrane. These fungi *do not* produce the acid reaction and redness, but the chemically-altered glandular secretions accumulate in the mouth, irritate the mucous membrane, redden it, make it hot and painful, and transform it into a soil favorable for the extuberations of the fungi. The cryptogamous growth makes as rapid progress in the mouth as upon any foul, vegetating surface, only with this difference, that here the soil does not become altered again, whereas, there it belongs to a living organism, and therefore never stops for a moment to regenerate itself from below, and from becoming cast off on the upper surface.

On inspecting the mouth, small white points will be seen, if the cryptogamous growths have only existed for a few hours; they soon become confluent at some places, form large patches, and often cover the entire mucous membrane with a thick white scab, which, on drying, turns yellowish from contact with the air, and may even become brown through an admixture of blood. Much difference of opinion has existed hitherto regarding these membranes; the manner of their adhesion to the mucous membrane, their relation to the epithelium, and the place of their primitive appearance, have been much disputed.

First of all, as regards their connection with the mucous membrane itself, it is claimed by some that they may be detached from the subjacent mucous membrane without producing any hæmorrhage; others deny this; both, however, are right. It all depends upon the time after their origin that the attempt is made to detach them. Shortly after their appearance they are really very firmly connected, and cannot be detached, even by an experienced hand, without inducing hæmorrhage; but, after a few days, they become loose, and the mothers will easily remove large patches with the finger without causing pain or hæmorrhage.

In order to answer the question in reference to the epithelium, I must, in the first place, review more minutely the microscopic condition of these membranes. There are seen, in every thrush-membrane, *spores*, *spore-bearers*, *thallus filaments*, and *basement epithelium*, all surrounded and enveloped in *a white*, *finely-granular substance*, from which, on the borders only, these structures can be made to project by squeezing. If successful in detaching a large piece, and its surfaces can be distinguished and separately examined, then, on the upper surface, mostly spores will be found, fewer thallus fibres, and many fully-developed basement epithelium-cells; on the lower surface, the one facing the mucous membrane, less or no basement epithelium-cells at all, fewer spores, but a dense structure of thallus fibres, which permeates throughout the whole finely-granular mass. If a piece of thrush-membrane is kept for a day in a concentrated solution of carbonate of potassa, its epithelium will be the first to disappear; the white granular mass becomes more homogeneous, more transparent, and is recognizable at some places only; the thallus fibres, however, the dense structure of which may now readily be discerned throughout the whole thickness of the membrane, have undergone no change.

On some of the yellow places of the membranes a diffused coloring matter is seen, dyeing the finely-granular mass yellow; it is indebted, for its origin, to small hæmorrhages. Two kinds of thallus fibres may be distinguished:

(1.) Broad with transverse striæ, very much after the manner of yeast fungi; and (2.) Narrow, with scarcely any striæ. The latter have no well-defined contours, are slightly granular, and are seen everywhere and in all cases, whereas the first kind is only exceptionally found. These spores flourish not only in the mouth, but grow also on other moist fermenting surfaces, upon a slice of an apple, for instance, as I have illustrated by experiments. (*Henle* and *Pfeufer's* Ztschrft. N. F. VIII. 2. Heft.) Erosions upon the external part of the lip, and even the anus, may become covered with it.

From all that has been said, the origin of the white membranes, and the relation of the fungi to them, may be regarded in the following manner: The first thallus filaments grow upon and between the uppermost epithelial layer; seek everywhere, like the roots of a tree on stony soil, for favorable space and ground, and finally lock in the entire epithelial strata, in a densely-fungous texture. Having reached the upper, the epithelial surface of the mucous membrane, they stimulate it to increased secretion, or, at least, aggravate the irritation caused by the acid reaction of the fluids of the mouth, and, henceforth, no complete epithelium-cells are formed from the blastema secreted for the formation of epithelium, but only a thick layer of granular substance. The fungi are therefore neither upon the epithelia, nor beneath them, but enclose them everywhere; within the layers facing the mucous membrane, it no longer attains to the formation of complete basement epithelium, the thallus fibres, like the granular mass, seize upon them, and permeate them in every direction.

As regards the primary place of origin, many authors assert that the primary white points represent mucous follicles, and that the fungi sprout from these. This statement can neither be confirmed nor denied, because it is well known that in the living child the orifices of these glands cannot be distinguished, and in the cadaver the presence of these thallus fibres in the follicles is no proof that they have actually originated there before they originated upon the free surface of the mucous membrane.

As regards the spreading of thrush, *Reubold* found that the fungi adhere to the pavement epithelium, and do not thrive upon the ciliated and cylindrical epithelium; consequently the parts subject to it are the mouth, fauces, œsophagus, and the epiglottis, down to the superior chordæ vocales, by which the hoarseness which occasionally supervenes is readily explained. The tolerably wide-spread view entertained by older physicians, that thrush may extend down into the stomach and intestinal canal, has never yet been confirmed by dissection. Although the possibility of thrush-membranes having been swallowed, and subsequently passing off by the anus in an undigested condition, cannot be denied, it nevertheless does not follow therefrom that they had originated in the stomach and intestines.

The duration of thrush, as a rule, is a short one, and in cleanly-kept and well-developed children very rarely lasts beyond the eighth day. In atrophic children, particularly when their incessant restlessness is appeased by the sucking-rag, it will last for many months, or until death.

This affection of the mouth, especially in foundling and lying-in houses, is extraordinarily frequently complicated with intestinal catarrh of the most malignant character. This complication is so common that *Valleix*, physician to the Foundling-house at Paris, regards the intestinal affection as an integral part of the disease, and describes it as such; but that is sufficiently contradicted by observations in private practice.

Children are attacked by cholera-like symptoms, become collapsed, the anterior fontanel becomes depressed, the eyes sink back deeply in their orbital cavities, the integument loses its elasticity and warmth, and, in from twelve to twenty-four hours, often become remarkably emaciated. The green, watery fæces, smelling strongly of rancid, sour fat, react decidedly acid; redden and erode in a short time the anus, genitals, the inner surfaces of the thighs, and the heels. That this diarrhœa, or rather its effects, and not the affection of the mouth, may lead to death, follows from this, that some children, with very severe thrush, suffer from no intestinal catarrh, and are perfectly well again immediately after the membranes have been cast off.

The *causes* of thrush are, then: (1.) The preponderating acid reaction of the mouth, which in the new-born is due to a faulty salivary secretion. The quantity of the acid mucus outweighs the alkaline saliva, and then the mixture reacts acid. (2.) The transportation from one child to another, particularly through one and the same wet-nurse in foundling-houses. (3.) The almost unexceptionally fermenting substances of the sucking-rag, which is sometimes allowed to lay about upon all dirty tables and places, and afterward is thrust into the mouth of the infant.

Therapeutics.—From a large number of experiments that I have instituted in this direction, I have come to the conclusion that a thrush-membrane, when kept in sugar or well-water, and in a not-alkaline reacting solution of salt, at a temperature of about 110° F., will, at the expiration of two days, produce a new crop of fungi, whereas in solutions of alkaline or metallic salts this does not take place. Thrush-membranes are effectually dissolved in concentrated solutions of caustic alkali only, which, of course, cannot be resorted to for therapeutic purposes. We have, therefore, no useful remedy that will chemically destroy the membranes in the mouth when once formed, but we can easily prevent their further spreading by topical applications of salts, with slight alkaline reaction. The whole treatment is based upon this: to rectify the acid reaction of the mouth, and this purpose is completely achieved by a solution of borax, ℈j, to water, ℥j, applied with a small camel's-hair brush every hour. The good effects of this remedy, however, are often completely thwarted by the unnecessary admixture of honey or syrup, for all substances which contain sugar very decidedly promote the growth of the fungi. By this solution of borax no diarrhœa is produced, nor is an already-existing one aggravated. It is absolutely necessary to discard the sucking-rag; even a milk-diet is injurious, on account of its containing sugar and casein. So long as the membranes exist it is best to feed the child upon bouillon and mucilaginous broths, and infus. verbasc., with little or no sugar at all.

APPENDIX.

(*a*.) The Signification of a Coated Tongue in Children.—It is necessary, first of all, to state that most nurslings in the first weeks of life have a white-coated tongue, along with which they do not display the least digestive disturbance.

Aside from that, the tongue becomes coated in most of the gastric and intestinal affections of small children, and probably only in consequence thereof does the appetite decrease. A thickly-furred tongue is but seldom met with in children; as a rule, a white flush only is observed, but this may exist for a long time after the appetite has returned, and may just as well be produced by local diseases of the mouth, thrush, stomatitis catarrhalis, diphtheria, injuries, chemical irritants, and burns, as by disease of the stomach or bowels. There are also permanent, or at least of several months' duration, partially-coated tongues, which possess no influence whatever upon the continuation of good health. A special name has even been invented for this condition, *pityriasis linguæ.* It consists of white islands, or circles or semicircles, the rest of the tongue being of a normal rose-red tint; these spots are entirely indebted for their origin to an accumulation of epithelium-cells. In atrophic children, transverse fissures are often seen upon a very smooth red tongue; the fissures display yellow bases, obstinately resist the cauterizing treatment, and do not disappear before death. The furred tongue of measles, scarlatina, typhus fever, etc., has the same significance in older children as in adults, and will be specially described with every individual affection.

The diagnostic and practical importance of the coatings of the tongue in children is, on the whole, not particularly great. In a uniform, although but a very thin, coating of the tongue, it is always advisable to be careful with the diet of the children, and, by regulating it, the digestion will improve, and the tongue will become clean.

(*b*.) Difficult Dentition (*Dentitio Difficilis*).—As the physiological condition of the eruption of the teeth has already been minutely treated of in the Introductory Remarks, it only remains to speak of the pathological conditions which originate during that process, and are decidedly dependent upon it.

Redness, pain, swelling, and increased secretion (or, in short, catarrhal stomatitis), are present in all cases. The frequent formation of blisters and small painful ulcers may be regarded as an aggravation of that process, and should be treated according to the precepts laid down on page 87 (*Stomat. catar.*). The necessity of the children to bite at something is satisfied by a piece of yew-tree root, or by a thimble firmly stuck upon the finger.

As ordinary or sympathetic results of the eruption of the teeth, the following make themselves manifest:

(1.) *Fever*, consisting in an increased temperature of the skin, especially on the forehead and cheeks, one of which often becomes red. Since no other cause for the fever can be discovered in the children, and as it nevertheless frequently occurs in dentition, it must therefore be assumed that it is induced by the latter.

(2.) *Convulsions*—the so-called spasms (*Fraisen*). The convulsions which occur here have nothing characteristic whatever, and are of the same nature as symptomatic convulsions in general. The most frequent muscular contractions are those of the eye; teething children often sleep with half-closed eyes, the eye-bulbs rolled upward, and nothing but white sclerotica can be seen through the tolerably wide-open palpebral fissure, a phenomenon so terrifying to the inexperienced parents, that medical aid is usually quickly sought. Twitchings of the facial muscles, a peculiar smile while sleeping, and short twitchings of the extremities, are observed in many teething children, who are extremely nervous, and attacked by reflex convulsions from the least indisposition—even from emotional causes. Since they make their appearance in many children every time a tooth breaks through, there is no reason why they should not be regarded as having direct connection with the dentition. Still, eclamptic attacks occur in some children with and without dentition, which may destroy them in a few minutes; and at the autopsy no material lesion whatever of the nervous centres can be discovered.

Treatment.—As these convulsions mainly occur in children with sluggish digestion and hard stools, and disappear when diarrhœa supervenes, the first indication must therefore be to increase the intestinal secretions and to accelerate the peristaltic movement of the bowels. A clyster or two of cold water should be administered to them, and, if this does not answer, a little manna, or a few teaspoonfuls of ℞. rhei aquosa. But, if a hot skin is also present, it will be necessary to produce more frequent stools, and a diminution of the temperature, which may be accomplished by a few powders of calomel, gr. $\frac{1}{8}$ to $\frac{1}{4}$ each. Much *éclat* has lately been made in England and France with the scarification of the gums. Some recommend a crucial incision; others, the removal of the whole cap which covers the head of the tooth. But, as an admonition, it is premised, in all the reports and laudation, that the tooth has to be very near eruption, otherwise the scarification will be of no benefit. I have frequently performed this operation, but have always found that the lancinated wounds of an inflamed mucous membrane heal very badly, and ulcerate for a long time; that the nervous symptoms continue notwithstanding, till ultimately artificial or spontaneous diarrhœa supervenes. Indeed, if we have to wait until the tooth is "very near" breaking through, then the process is in fact near its end, and any other simple remedy is as efficacious as this, which is attended by a considerable amount of pain. Affusions of the head with cold water, performed every hour or two, are, it is true, a not very tender, and by parents not much admired, remedy; it is, however, very useful against all convulsions in children, and therefore also against those occurring during dentition.

(3.) *Cutaneous Eruptions.*—Children with a fine, smooth skin, or the progeny of parents who are affected with chronic skin-diseases, are attacked in each of the five periods of dentition by one or the other form of eruption, which, in the subsequent dentition periods, displays tolerably similar pathological characters to those which took place at their first appearance. The principal forms are:

(a) *Urticaria.*—An eruption of wheals (Quaddeln) (Pomphi).—By this we understand a severely-itching eruption of the skin, of several lines in circumference and mostly round, or sometimes of an oblong shape, not very prominent, and having a flattened upper surface. Most of the wheal-like eruptions are of the normal integumentary color, while the part of the cutis contiguous to them appears to be reddened. Occasionally they are even paler than the rest of the skin; the epidermis never becomes detached from the cutis. The stings of nettles (hence nettle-rash), in some persons also the bites of fleas, will produce a wheal-like eruption, which differs in no respect from that produced by internal causes—dentition, for example. It disappears almost entirely in a few hours, the red zone remains for a short time, but that also fades very rapidly, and then nothing is to be seen of the eruption. From fifteen to twenty of these circular patches make their appearance, either simultaneously or one after the other, disappear, and are succeeded by others on other parts of the body. Generally, this affection of the skin is relieved only after the completion of a dentition period, and breaks out anew at the beginning of the next period. The treatment should be limited to the use of bran-baths, and inunction of fat, to mitigate the excessive itching, which is very troublesome and annoying.

(b.) *Lichen and Prurigo.*—These are two papular exanthema; the first, also called lichen strophulus, has its hard papules mostly accumulated in clusters, while the papules of the latter are flatter, lower, and isolated. In both exanthema the tubercles are at first paler than the normal skin, but through scratching are soon bereft of their apices, and in place thereof display a small brown crust of the size of a pin's head. If a lichen papule is pricked open very superficially with a fine needle, a drop of blood will exude; a prurigo papule contains only a minute drop of serous fluid, but, by severe scratching, may also be made to bleed. When these scratched papules are situated near each other, their crusts will coalesce, and present a large ulcerated surface, and it will then be entirely impossible to recognize the primary manner of their origin.

(c.) *Eczema and Impetigo.*—By eczema, we understand an inflammation of the skin, produced by an accumulation of serum beneath the epidermis, in the form of minute aggregated vesicles, and is distinguished as eczema simplex and eczema rubrum. In eczema simplex the skin is but slightly swollen and reddened. Thin yellow scales form after the vesicles have burst and dried up, and, after they have fallen off, a new epidermic layer is produced. Eczema rubrum mostly develops from the former, and is differentiated from it by the integument around the vesicles being of a darker red color and more tumefied, and the course of the disease becoming more chronic. There is a tendency to form a new crop of vesicles, and a red, infiltrated furfuraceous skin remains behind for a long time after the crusts have desquamated. In impetigo, in place of vesicles, larger pustules, filled with matter, usually aggregated, originate, and, after they have ruptured, thick moist, yellowish-green or brown scales form, and, when these have dropped off, the reddened corium will be seen exposed, discharging a sero-purulent fluid, and soon becomes covered anew by a thick crust. The affected part of the skin remains brownish red and infiltrated for a long period after recovery has taken place.

The forms of skin-disease mentioned in paragraphs *b.* and *c.* naturally do not disappear immediately after the eruption of the teeth; they improve very much, however, while previous to that they constantly grew worse. It is not yet conclusively settled that they are always connected with dentition, for there are many children who do not acquire these eruptions until after they have cut all their teeth. But this much *is* established, that very many children are attacked by these exanthema, most frequently by lichen, at the eruption of the first tooth, suffer from it a while, lose it, and at the next new difficulties of dentition again become affected with it.

The treatment of these skin-diseases is extremely simple. The hairs should be carefully removed, if any eruption exists beneath them. Thick crusts must be softened with oil, and the hairs cut off at the roots beneath the crusts. I have found the ung. zinci oxid., rubbed in twice daily, to be very efficacious against the intense itching. So long as the patients are free from fever, they should be bathed in a tepid bath of wheat-bran for a quarter of an hour daily. There is no very great indication here for internal remedies, and those which derange the digestion should be avoided. In eczema rubrum, which often lasts very long, the liq. potas. arsenicalis, from two to five drops daily, may become necessary, in regard to the use of which, more minute details will be given in the chapter on the Diseases of the Skin. It is always advisable to cut off the nails as short as possible, of all children suffering from cutaneous eruptions, in order to make the scratching as harmless as possible.

(4.) *Intestinal Catarrh.*—When a child cutting its teeth has a red mouth and augmented salivary secretion, it becomes affected with watery evacuations as a result of swallowing the saliva, for the salts it contains act as a mild aperient. A mild diarrhœa, five or six evacuations in the twenty-four hours, is very beneficial to teething children, for cerebral affections are thereby most surely prevented. It occurs, in fact, as often as stomatitis catarrhalis, and both processes might very appropriately be regarded as physiological conditions, if their aggravations, which often attract attention, did not attain to distinct diseases, and really display serious characters. The transition of this simple catarrh of the bowels into an infiltration of the follicular apparatus of the mucous membrane, attended by profuse discharges and rapid general emaciation, very frequently occurs, and in most instances terminates in profound collapse and death.

The treatment is precisely the same as that of intestinal catarrh originating from other causes, and will be described in detail with the affections of the bowels.

(5.) *Bronchial Catarrh.*—There are children who, at the eruption of every tooth, are attacked by a severe bronchitis, which disappears again immediately after the tooth has broken through. This bronchitis seems to be induced by external causes. The large quantity of saliva secreted in stomatitis catarrhalis soaks through the clothes, covering the chest, and produces a diminution of the temperature of the breast, as a result of which swelling and increased secretion of the bronchial mucous membrane ensue. If the chest is prevented from becoming wet, for example, by inserting a piece of oil-silk between the garments, the child will pass through the whole process of dentition without once being affected with bronchitis. So many striking and oft-recurring examples of this dentition-bronchitis have occurred to me, that I do not hesitate to attribute a part of the bronchial catarrhs to dentitio difficilis.

Treatment.—The treatment consists in protecting the chest, best accomplished by employing large-sized slavering-bibs lined with thin gutta-percha cloth or oil-silk; the cough then almost always disappears spontaneously in a very short time.

(6.) Finally, there is *a blennorrhoic affection of the conjunctiva palpebrarum*, which occurs at the eruption of the upper cuspid and incisor teeth. Here both eyelids, particularly the upper, suddenly swell up, and become so infiltrated that it is only with the utmost difficulty, and scarcely ever without bleeding from the squeezed eyelid, that a sight can be obtained of the globe. The discharge is not so yellow and purulently thick as in ophthalmia blennorrhœa neonatorum, but more muculent, shreddy, resembling more the discharge from the nose after a catarrh of the nasal mucous membrane has subsided. I have never been able to ascertain whether it possesses any properties of infecting the other eye of the same or of another person. The parts around the lids are generally eroded. On examining the mouth of a child laboring under this form of inflammation of the eye, a painful redness and swelling of the corresponding upper jaw, and one or two tubercles answering to the first molar or incisor-tooth, will be found; its popular denomination, " eye-tooth," is therefore not without sufficient reason.

After all, this inflammation of the eye has nothing wonderful about it, when we bear in mind that the floor of the Highmorrian cavity is often barely of the thickness of paper, and consequently a propagation of the congestion or inflammation upon the mucous membrane of this cavity may very readily take place. But the mucous membrane of the antrum Highmorri stands in direct communication with the conjunctiva through the nasal passages and lachrymal sac, and we merely have here a propagated inflammation of the mucous membrane. The prognosis of this seemingly very dangerous evil is favorable. Formerly, in accordance with the precepts of the most eminent ophthalmologists, I used to torture the poor children with cauterizations of nitrate of silver, and was delighted with my splendid success. But, for several years past, I have treated at least a dozen cases with nothing but dry warmth, discarding the cauterizations altogether, and have accomplished still more rapid and painless cures. I apply a piece of cotton-cloth to the eye, smeared with simple cerate or ung. zinci, and over that a bag loosely filled with warm bran. I cause the cerate rag to be removed every two hours, the eye to be sponged with a pointed piece of soft sponge dipped in warm water, and then reapply the warm bran bag as before. After one, or at the most two days, the œdema has subsided so much that the patients are again able to open the eyes tolerably wide; then they will no longer tolerate the bran bags, and, after several days more, there is nothing more to be seen about the affected eye than a slight redness and irritability of the lids. If the mouth is now examined, the stomatitis will be found improved or wholly gone, and a previously unperceived head of a tooth cut through. During and after the subsidence of the œdema of the lids, mild astringent eye-washes, zinci sulph., or cupri sulph., gr. j, to water ℥ j, may be dropped into the eye with advantage.

These are the principal and most frequent complications of dentition; their actual dependence upon it has long ago been acknowledged by all thoughtful physicians. Of late, however, a few, and some of them widely-known Pædiatricars, have denied this connection *in toto*, and either did not observe the frequent concomitance of the just described diseases with dentition, or declared them to be merely accidental.

B.—*PAROTIS.*

(1.) Inflammation of the Parotid Gland (*Parotitis*).—There are three kinds of parotitis: (*a*) idiopathic, (*b*) secondary, and (*c*) metastatic parotitis.

(*a*.) *Idiopathic parotitis* occurs only in an epidemic form, and, on account of its general spreading, and the almost comical appearance which it gives to the patients, has received a number of, in part, scurrilous names, such as mumps, clown's disease, Ziegenpeter, etc. It has many analogies to the acute exanthema, attacks a person but once in his life, occurs most frequently in the youthful age, and has a tolerably well-marked cyclical course. Children under one year of age are hardly ever affected with it. It prevails most frequently in the spring of the year, sometimes also in the autumn; and on the damp coasts of Holland, England, and France, it is said to be endemic.

Symptoms.—Usually, a few prodromes precede the mumps. For one or several days the children feel tired, are ill-humored, feverish, lose their appetite, and voluntarily betake themselves to bed; indeed, nervous children also manifest cerebral symptoms, headache, delirium, convulsions; ravenous children throw up their last appetiteless-swallowed meal. After one, at the most two or three days, they begin to feel pain under one ear, which becomes markedly aggravated on opening the mouth, mastication, or external pressure. A swelling is at the same time discovered in the parotid region; first, the depression between the lower jaw and mastoid process becomes filled out, and in its place a tumor is found, which pushes the lobe of the ear outwardly, and extends beyond the boundaries of the gland. The subcutaneous cellular tissue of the corresponding cheek up to the lower eyelid, and of the neck, becomes infiltrated with serum, so that the movements of the lower jaw and all the mimical movements of the facial muscles upon the affected side cannot be performed. The induration is situated at the place where the gland itself lies, is most marked there, and decreases peripherically. The external swelling is tolerably soft and doughy; the pressure of the finger leaves a pit. The integument covering the tumor is slightly inflamed. Frequently only one parotid swells up; when both are affected, they are not usually attacked simultaneously, but one is generally a few days after the other; nor is it necessary that both should attain to an equal size. At the acme of the disease the patients are totally unable to open their mouths, and speak but very indistinctly; the salivary secretion is seldom diminished, often somewhat augmented, occasionally profuse ptyalism also occurs, but, on account of the absence of ulceration of the mucous membrane of the mouth, it does not diffuse the disgusting fetor of mercurial salivation. As very rare complications, angina tonsillaris, and pharyngitis, may be mentioned. Suffocative attacks very seldom occur here, because the swelling extends outwardly and not inwardly. In most cases the affection of the general system is of but short duration, and slight. So long as the swelling is extensive, hard, and painful, it will, in most instances, be attended by fever; but, by the third or fifth day, the local trouble only will be present. The metastatic swelling of the testis, in adults, frequently that of the same side, already observed by Hippocrates, on the whole, occurs extremely infrequently: for instance, in the epidemic which prevailed in Munich, in 1857, where certainly several hundred men were affected, it was seen but once, so far as I am aware; it is never met with in children.

Nor have I ever yet seen the other metastasiæ, to the cerebral meninges, to the serous sacs, to the bronchial and intestinal mucous membranes; still, I do not venture to deny them altogether, for it is well known that in some epidemics great variations of the same disease may take place at different times. If our followers should witness an epidemic of parotitis, to which the description of our contemporaries is not exactly applicable, it is to be hoped that they will at least have so much consideration as not to regard our present delineation as purely inventive.

Course and Termination.—The course of an epidemic idiopathic parotitis is almost unexceptionally favorable. After the affection has been growing worse for from two to five days, the fever, and with it the swelling, begins to subside, and by the tenth or the fourteenth day all the general and local symptoms have disappeared completely. Complete resolution of the swelling almost always takes place; in some scrofulous children this is somewhat longer in being accomplished: the parotid gland and the lymphatics surrounding it are for some time hypertrophied and indurated. Suppurative degeneration of the gland does not seem to have been so rare in former epidemics as at present. The abscess may burst either directly outward, or into the external meatus auditorius, when otorrhœa and hardness of hearing will remain for a long time, and, in cases where the tympanum has been perforated, life-long deafness will be the result. When the chronic indurated gland comes to press upon the facial nerve, or if the nerve becomes involved in the suppurative process, temporary or permanent motoric facial paralysis will ensue. The prognosis, according to what has been said, is extremely favorable. At the beginning of an epidemic, the physician has an opportunity to see many cases of mumps, but, after several weeks, the public become so thoroughly convinced of the utter harmlessness of the evil, that most parents seek no medical advice at all.

Pathological Anatomy.—The pathological anatomy of this disease, on account of its being so rarely fatal, is somewhat meagre. I have never yet had an opportunity to make a *post-mortem* examination on a case of parotitis epidemica. *Bamberger* reports as follows in relation thereto: The whole gland appears enlarged and reddened, its tissues are swollen and flaccid, for primarily a fibrinous exudation of various grades is deposited in the interstitial substance that connects the acini of the gland with each other, and in the cellular tissue surrounding the gland. In severer forms, the inflammation attacks also the glandular structure itself; this is then found reddened and injected, and the entire gland appears to have become hypertrophied into a uniform, carnified, tough mass. The exudation may now either be absorbed again, when the gland will return to its former normal size and consistence, or the exudation deposited in the cellular tissue becomes solidified and organized, and leads either to a permanent increase in size, or to an absorption of the gland, when, as a result of compression, the proper glandular structure gradually atrophies and becomes obliterated.

Therapeutics.—The treatment of parotitis is that of adenitis in general. As long as general febrile symptoms are present, rest, strict diet, and acidulous drinks, are indicated. The swelling itself is most conveniently treated with inunctions of oil. Cold does not in the least accelerate the resolution of the swelling. Cataplasms and bran-bags are inconvenient and annoying, cause congestion of the head, and are but very unwillingly tolerated, especially by small children. If the parotitis is attended by very severe pain, and extensive, tense swelling, a few leeches will be found useful. Great restlessness is soothed by a solution of morphine (gr. ¼ to water ℥ iij), a teaspoonful of which may be given every hour till its effects become apparent. Subsequent indurations must be treated by inunctions of mercurial ointment. The use of cod-liver oil for several months may prove of great benefit, as most children affected with this disease are scrofulous.

(*b.*) *Secondary parotitis* is a very rare disease, and arises from protracted affections of the deeper structures of the mouth. The principal causes of secondary parotitis are mercurial salivation, diphtheria, or a neglected stomacace. It never attains the size, extent, and hardness of the epidemic parotitis, the face is not disfigured to such a degree, and the lobe of the ear is never pushed so far upward. The symptoms are limited to a slight swelling, and to pain upon pressure from without, and on mastication. The lymphatic glands lying around and upon the parotid, and which, in affections of the mouth, swell up earlier and oftener than the parotid gland, render the diagnosis materially difficult. The best diagnostic cardinal points will always be the position of the lobe of the ear and the course of the disease. Thus the tumefied parotid undergoes resolution sooner and more regularly than the cervical lymphatics, which often become indurated, or degenerate into suppuration. In rarer instances, it may also terminate in suppuration, whereby severe general phenomena, a tardy increase in the size of the gland, and, finally, fluctuation and pointing, will take place. After a profuse and exhausting discharge, the process terminates in complete atrophy of the suppurating gland. As secondary parotitis is usually confined to one side, and as the mouth is thereby very severely affected, nothing definite can therefore be stated regarding the character of the salivary secretion of the diseased gland.

The *treatment* is principally to be directed to the disease of the mouth, for which kali chloricum must again be mentioned as the sovereign remedy. The remainder of the treatment of the affection of the mouth will be found already described in the corresponding chapter.

(*c.*) *Metastatic parotitis* occurs in the course of typhus or scarlet fever, of variola, of measles, and generally in the first few days, at the climax of the disease, in which case death almost invariably follows, or with the ushering in of convalescence, and then a far more favorable prognosis may be given. The etiological connection of parotitis with these exanthema is very uncertain. Among other causes, especially for typhus fever, a mechanical occlusion of the ductus Stenonianus, as a result of the dryness of the mouth, must, at any rate, hold good. In the cadaver, the parotid and its contiguous parts are found swollen, and the gland itself dotted with a number of small abscesses, the contents of which are either yellow thick pus, or brown sero-sanguinolent ichor. In grave putrid fevers, a general gangrenous sloughing rapidly ensues, by which the entire gland and its adjacent textures degenerate into an ichorous, brownish-green, fetid, decomposed mass.

The symptoms vary in accordance with the degree of the general affection. If the typhus fever or the acute exanthema has reached an intense degree, the patients will be totally unaware of the existence of the complication; if, on the other hand, it comes on during convalescence, they will present the same subjective phenomena as in the idiopathic, epidemic form. In general, it may be stated that metastatic parotitis runs a slower course, and much more frequently degenerates into suppuration, than the secondary, and still more than the idiopathic. Here the transition into suppuration takes place very often. The objective signs, size, extent, and hardness of the tumor, are of the same character as in the epidemic parotitis. Although, in the other forms, the question, whether, in reality, the glandular parenchyma, and not the connective tissue surrounding the entire gland, and existing between the acini, is affected, must still remain undecided, nevertheless, in this metastatic parotitis, a parenchymatous disease may be assumed with certainty, by reason of the frequent and numerous abscesses found.

The *treatment*, in the gravity of the complication, plays a subordinate part. Warm bran-bags, if the patients will tolerate them, seem to have a favorable influence upon the resolution of the swelling, and mitigate the pain. Incisions can only be made advantageously when distinct fluctuation is felt. If no pus is evacuated by a deep incision, consequently no abscess having been opened, no amelioration whatever will ensue; on the contrary, still greater œdema and troubles result from this traumatic parotitis. If the process has made its appearance during a convalescence, it will be protracted uncommonly long, and life will have to be sustained by a tonic and stimulating treatment, with wine, eggs, infus. carnis, meat, quinia, etc.

(2.) HYPERTROPHY OF THE PAROTID GLAND.—There is (*a*) a benign and (*b*) a malignant hypertrophy of the parotid gland.

(*a.*) The benign form may originate slowly and spontaneously, but is oftener the result of the above-described inflammatory conditions. Occasionally benign, fibroid, adipose, or cystic tumors, also develop themselves in the gland. The integument over the benign tumors is always displaceable. Simple hypertrophies are always unilateral, the pain on pressing the gland is very slight; the lower jaw is therefore always sufficiently movable, even in tolerably large swellings. It is differentiated from scrofulous induration of the cervical glands by the lobe of the ear being pushed off; the glands are more movable, and generally found in large numbers.

Treatment.—Simple hypertrophies may be made to diminish in size, or to disappear altogether, by an external application of iodine, once or twice a week, continued for some time; benign lipoma, and other tumors in the parenchyma of the gland, of course, do not disappear under the use of iodine; they must be removed by the knife, whenever they are sufficiently superficial, and it is possible to enucleate them without too great vascular and nervous injury.

(*b.*) Malignant hypertrophy of the parotid consists in the exuberation of a medullary or fibroid carcinoma in the parenchyma of the gland. It, however, never occurs primarily and isolated in the parotid; in most instances, it appears with a simultaneous carcinomatous deposit in other organs, and, as carcinoma in general, is extraordinarily rare in children. Where the carcinoma attains to a considerable growth inwardly, pressure upon the pharynx and larynx, and upon the large vessels and nerves of the neck, may ensue. The tumor also grows anteriorly, occasionally over the ascending ramus of the lower jaw, the contour of which then becomes indefinable. It is almost wholly immovable, and, according to the nature of the heteromorphous growth, hard (in fibrous carcinoma), or soft, even fluctuating (in medullary carcinoma).

The integument in the first kind is immovable, having become identified with the hard tumor. Tuberculous infiltration scarcely ever occurs in the parotid.

The treatment is as for carcinoma in general, merely life-prolonging. I am unable to say whether by extirpation of the carcinomatous parotid, one of the most dangerous and difficult operations in surgery, a child has ever been saved.

C.—*PHARYNX AND ŒSOPHAGUS.*

(1.) Angina Tonsillaris. *Cynanche* (literally the "dog's collar," from κύων, the dog, and ἄγχειν, to strangle).—The tonsils are aggregated mucous follicles, which in the normal condition ought to project barely above the arches of the palate, between which they lie. On the surface facing the isthmus faucium ten to twenty excretory ducts of mucous crypts are found, which give to the tonsils a perforated appearance, similar to that of the shell of an almond. Now, these ten or twenty crypts of each tonsil are subject to inflammation and suppuration, in which, like the furuncles of the cutis, the contents of one or several follicles induce suppuration of their surrounding textures, and finally are discharged by an opening that forms in the abscess. In this process, the whole parenchyma of the tonsil swells up, and is much disposed to pass over into a state of chronic induration; the latter condition may also originate spontaneously without having been preceded by suppuration of the crypts, and it then will be bilateral. A hollow, depressed excavation remains behind after each suppurative process, so that when the malady has recurred often the tonsils appear torn and ragged, but are thereby greatly reduced in size. The oftener angina tonsillaris has occurred, all the more probable is it that all the follicles have been destroyed, and all further opportunities for future inflammations have thereby been abolished; a rare example of a radical cure by Nature herself.

Symptoms.—The disease begins with difficult deglutition, pain, heat, and dryness of the throat. The affected tonsil becomes uniformly enlarged, and may be felt externally beneath the lower jaw as a small tumor. If both swell up simultaneously, as happens very often, they will touch each other; and all the symptoms become greatly aggravated, till finally even suffocation may ensue. Here the voice always becomes snuffling; the pain radiates toward the ear; as a result of the upward pressure of the posterior pillar, the passage leading to the pharyngeal opening of the Eustachian tube may become mechanically closed, and in this manner tinnitus aurium and hardness of hearing may be produced. The pain is greater on swallowing fluids than solids, such as bread and meat, for these, by their solidity, bore their way through, while fluids can only be forced through by the uniform pressure of the whole mouth against the swollen tonsils.

In examining the mouth, some precautions are to be exercised; the patients should be placed opposite a bright window, and at first simply be ordered to open the mouth, by which the entire process is often readily seen, especially if, at the same time, they put out the tongue and take a deep inspiration. If it is not possible in this manner to obtain a good view of the tonsils, the tongue will have to be depressed; and to this, according to my experience, the children submit themseves more readily when it is done with the finger than spatula or spoon-handle. Moreover, the tongue can be depressed much deeper with the finger than with the spoon-handle, and the head can also be more readily fixed. The soft palate is now seen to be reddened and the highly-inflamed tonsils covered with thick tenacious mucus. They fill up the greater part of the isthmus faucium. When the angina has existed for a couple of days, a few yellow dots will be observed on the tonsils, which, on puncture, emit a considerable quantity of fetid pus, and after a few days recovery is established, so far, at least, as the objective symptoms are concerned; for, notwithstanding the loss of substance, such a tonsil remains enlarged for years. Acute angina tonsillaris, with pain, difficult deglutition, and fever, in children, seldom lasts longer than five or six days, then the abscess bursts, or, if it does not attain to suppuration, it will pass over into the chronic, painless induration.

As regards its etiology, the disease sometimes occurs in an epidemic form; generally, however, the cases are only sporadic, and occur in particularly predisposed individuals. Aside from this, inflammation of the tonsils is a constant attendant upon scarlatina; here, however, it does not usually pass over into the suppurative state. It is also sometimes met with in secondary syphilis, which, on the whole, manifests itself on the soft palate and tonsils more rarely in children than in adults.

Therapeutics.—The treatment varies according to the age of the child. Small children under three or four years, who are less liable to this disease than those in whom the permanent teeth have appeared, are, it is well known, unable to gargle, and never retain water in the mouth, but swallow it directly. Thus, one of the principal palliative measures cannot be employed in these cases. The very popular eibis gargles mitigate the pain less and cannot remove the mucus that constantly coats the tonsils and fauces as well as cold water, which the patients should be induced to hold in their mouths, not gargle, till it becomes disagreeable to them by its own warmth; it is then replaced by fresh water. Thick cataplasms and bran-bags, in which half of the heads of patients are generally wrapped up, are said to accelerate suppuration, but they certainly make the head hot and discommode the child. I am more convinced that they produce the latter effects than the former, and for that reason do not employ them. Rubbing the neck with oil soothes the pain, and does not heat the skin. In adults severe anginous troubles may be mitigated very rapidly by a few leeches; in children, however, the loss of blood, and apprehension and excitement attendant upon the application of leeches, deserve more consideration. Incisions into the intensely-swollen tonsils, with which, in adults, great mitigation and abortion of the pain may be effected, require, first of all, the consent of those to be operated upon, which is useless to hope for in children. But where the dyspnœa is very great, and suffocation imminent, they have to be made, and cannot be replaced by the repeated use of tartar emetic. We succeed very rarely in causing the abscess to burst through retching. In that case, at any rate, the matter must have been very superficial, and in all probability would have been spontaneously evacuated in the next few hours.

In acute angina tonsillaris we may limit ourselves, therefore, to gargles of cold water and inunctions of oil. If suffocation threatens, incisions must be made into the tonsils, and when, owing to the great restlessness of the child, and for want of proper assistance, these cannot be safely performed, then an emetic may be tried. The constipation that is usually present is very appropriately relieved by a mild laxative such as decoct. tamarind, inf. rhei, or by a few teaspoonfuls of ℞. rhei aquosa.

(2.) Hypertrophia Tonsillarum.—There is an hereditary hypertrophy of both tonsils which develops very early in life, often in the second year, and is not the effect of anginæ. Here both tonsils are equally swollen, push the soft palate forward, lock the uvula in between them, enlarge upward toward the posterior nares, and thereby produce a snuffling voice. Occlusion of the mouth of the Eustachian tube induces tinnitus aurium and hardness of hearing. No redness, pain, or subjective symptoms, are present here; the dyscophosis, the snuffling voice, the keeping open of the mouth both night and day, a perpetual snoring during sleep, are the main signs that induce us to examine the tonsils, which are then found decidedly enlarged, and may also be felt from without.

I never observed atrophy of the respiratory muscles, and that peculiarly-shaped breast, pectus carinatum (pigeon-breast), first stated by *Dupuytren* to be the effects of hypertrophied tonsils, or, at least, they did not seem to be such frequent concomitants of this condition that an actual relative dependence might be deduced therefrom. There are a number of very-well-developed children who do not show the least trace of a pigeon-breast, or the least affection of the chest and thoracic viscera whatever, and yet suffer from hypertrophied tonsils; and again a still greater number of children, notwithstanding perfectly normal tonsils, are afflicted with a very severe degree of pigeon-breast and imperfect development of the pectoral muscles.

Before the commencement of puberty an arrest in the growth of the hypertrophied tonsils takes place, and in the adult the free space between them becomes enlarged. Children afflicted with this complaint are liable to acute anginous affections, and it is often accompanied by diseases of the skin, eyes, and bones.

Treatment.—The milder forms require no treatment at all. I have seen a remarkable diminution of the hypertrophied tonsils under the use of cod-liver oil for several months, given for other scrofulous complaints, but in the severest grades of the evil this remedy failed entirely. By cauterizations with nitrate of silver, skilfully performed, so as to give the children no pain or embarrassment, twice weekly and continued for a long time, a tolerable diminution in the size of the tonsils will be obtained, and in many instances the children, or rather their relations, will thereby be spared an operation. But where the evil is of a very serious degree, extirpation of the gland is absolutely called for; as otherwise the children may perish by suffocation. The operation is best performed with *Mathieu's* tonsillotom, with which the gland is first transfixed and then abscised. Children who are taken by surprise, and have no presentiment of an operation, willingly allow their tonsils to be embraced in the instrument, and in the next moment the glands are cut off, the patient hardly being aware of what has happened. The removal of one tonsil suffices to open the isthmus faucium; sometimes the operation may be performed immediately afterward on the other side; usually, however, the child resists it, and it is not advisable to use chloroform, as the blood from the severed tonsil may flow down into the air-passages.

The wound should be allowed to heal, and the other tonsil is cut off some other time, if the symptoms are not sufficiently mitigated by the first operation. The amputation of the gland by the aid of *Mussex's* forceps and knife is very laborious, and also very dangerous, on account of the close proximity of the internal carotid, which internally and behind is in relation with the tonsil, for in restless children it is liable to be injured.

(3.) RETROPHARYNGEAL ABSCESSES.—According to *Bokai*, abscesses of the posterior wall of the pharynx may be divided, in respect to the manner of their origin, into three kinds: (*a*), into such as develop themselves idiopathically from an inflammation of the pharynx and of the cellular tissue surrounding it; (*b*), into such as form secondarily, the result of suppuration of inflamed cervical glands; and (*c*), into such as are complicated with caries of the cervical vertebræ.

In all the three forms the first symptom is always a slowly-increasing pain on swallowing, to which a certain amount of stiffness of the neck, in the motions of the head without any externally perceptible diseased condition of this part, soon becomes superadded. The voice assumes a snuffling tone, and, on examining the mouth, the pharyngeal space is found constricted, the posterior wall of the pharynx not equidistant on both sides from the soft palate, and of a livid color. As the disease advances, the stiffness constantly grows more marked, the head is bent backward, and dyspnœa appears whenever the chin is made to approximate the sternum. The neck in the region of the angle of the lower jaw becomes slightly thicker. Fever and restlessness supervene, and increase from day to day with the growth of the abscess. In the highest grade of this evil children are totally unable to swallow, breathe very laboriously, with painfully-distorted features, the respirations are loud, stertorous, but *not whistling*, as in croup, for which, at first sight, the disease might be mistaken, especially since here, too, the speech becomes indistinct and the voice tuneless. The mouth is constantly full of mucus, and finally the posterior pharyngeal wall, on touching, fluctuates tolerably distinctly. The abscess may attain to such a size as to get in front of the soft palate, which will appear to lie upon it. When it extends deeply downward, even the os hyoid and larynx will be pushed forward or to one side, and, when at last it is opened, a large quantity of matter will flow out with a gush, followed by an instantaneous remission of all the phenomena; spontaneous bursting of the abscess during sleep is said to have caused death by suffocation, the pus filling up the larynx.

In the second form, following upon suppuration of the cervical glands, enlarged or suppurating lymphatics will in addition be found on the neck; and in the third, the most frequent kind, the preceding signs of disease of the cervical vertebræ for many months, such as pain and difficulty on rotating and bending the head backward, drawing upward of the shoulders, and hypertrophy or alterations in form of the affected vertebræ, may be observed. Although suppuration of the cervical lymphatics belongs to the common diseases of childhood, still retropharyngeal abscesses, resulting from this affection, are of extreme rarity. I have never yet met with this sequela of suppuration of the lymphatic glands. The *prognosis* in retropharyngeal abscesses is always doubtful; when they are accompanied by caries of the vertebræ, it is almost always of the fatal issue.

Treatment.—Since the diagnosis cannot be established with certainty till after the abscess has formed, but little can therefore be expected from antiphlogistics, leeches, ice, and laxatives, still less from resolvents, blue and iodine ointment, tincture of iodine, and cataplasms.

Patients a few years old derive the greatest relief from pieces of ice in the mouth, as it exercises an astringent and local anæsthetic influence. But when the physician has convinced himself of the existence of an abscess, an early opening is the only means whereby the harassing symptoms can be removed. When disease of the vertebral column is at the same time present, which, after all, is not very easy to diagnosticate, *Bamberger* justly advises to defer the operation until actual danger threatens, for the superaddition of air always accelerates the progress of the carious destruction of the vertebræ. If any improvement in caries of the cervical vertebræ is expected to ensue, then constant quiet rest in bed upon the back for several months is indispensably necessary. Conjointly with this, of course, the strength is to be supported in every manner possible, and subsequently the attempt must be made to cause absorption of the hypertrophied tissues of the vertebræ by the insertion of a seton, as well as by a long-continued use of iodide of iron.

(4.) INFLAMMATION OF THE ŒSOPHAGUS (*Œsophagitis*).—Almost all the affections of the mucous membrane of the mouth may extend down upon the mucous membrane of the œsophagus to the cardiac orifice of the stomach. Thus there is a catarrhal, mercurial, and diphtheritic inflammation of the same. Thrush also may extend down to the stomach. The most frequent form of disease of the œsophagus, however, is that produced by corrosive substances and foreign bodies. It scarcely ever occurs in children under one year of age, because these are still too simply fed, and are not apt to catch injurious articles and swallow them.

The symptoms of œsophagitis are as follows: Burning or lancinating pain at some part of the œsophagus, in the neck, in the back, between the scapulæ, or in the præcordia. Deglutition is always attended by pain; even the blandest fluid, the saliva itself, does not pass down without pain. Retching or actual vomiting will take place according to the severity of the pain; deglutition is particularly embarrassed in the dorsal decubitus, for, when the head is thrown far backward, the anterior wall of the cervical column forms a convexity which protrudes into the fauces; on this account it is customary to raise the head of a child whenever any thing is administered to it. The thirst in œsophagitis is very tormenting, but, for fear of the pain, children will refuse all drinks for days. Since the most common causes of œsophagitis are scaldings with hot water, lye, and concentrated acids, the principal morbid lesions are therefore always found in the mouth, and from these a conclusion may be arrived at as to the condition of the mucous membrane of the œsophagus. If ulcers have formed, they will heal but very slowly, for the œsophagus is stretched and distended every time any thing is swallowed, and strictures will almost always be the result; these slowly grow worse, the calibre of the tube, after many months, becomes contracted, and constantly grows narrower. Besides this œsophagitis from burns, which mainly originates through the ignorance or clumsiness of children, who, instead of instantly spitting out again the corrosive fluids, swallow them, there is yet an œsophagitis of traumatic origin. It is produced by swallowing certain articles, such as fish-bones, fragments of meat-bone, needles, and by sharp bodies of all kinds which remain sticking in the gullet, and clumsy and rough attempts to remove them. Finally, ulcers of the œsophagus have also been met with as a result of the administration of large doses of tartar emetic, in powder.

Treatment.—All attempts to remove foreign bodies are attended by the greatest uncertainty, since it is impossible to arrive at any exact knowledge of the place of fixture and the character of the extraneous substance. Nor are they always necessary; for there are a number of articles, such as crusts of bread, hard cake of all kinds, even bits of wood, which, if allowed to remain for some time, become soft, and are subsequently carried down by some swallowed fluid. The longer the foreign body has remained, the more difficult it will be to remove it, because the inflammation of the œsophagus constricts its calibre. The attempt to push down sharp objects into the stomach may terminate disastrously, for it is just as easy to push them through the coats of the œsophagus as into the stomach. If the foreign article does not completely fill up the calibre of the gullet, as is scarcely ever the case with sharp or angular objects, it may sometimes be removed by an instrument let down over it, at the end of which there are a few blunt hooks, or by one that may be made to unfold after the manner of an umbrella.

Against chemical burns, if they are of but very recent occurrence, antidotes—acids against alkalies, and *vice versa*—must be administered properly diluted. Subsequently emulsions are to be given, and, to palliate the thirst, bits of ice are allowed to be melted in the mouth, if the child obstinately refuses to swallow. It will scarcely be necessary to prohibit the partaking of solid nutriments, as the mere attempt causes intense pain. If the pain is very severe, warm-water compresses should be applied to the neck, and opium given according to the age of the child: to a child two years old, one drop of laudanum; to one of three years, two drops, and so on, one drop more for every additional year. A very disagreeable and frequent termination of ulcerations of the œsophagus, such as result from chemical or mechanical irritants, are strictures, which must be prevented by the passage of bougies, after the manner of strictures of the urethra. Where they already exist, the frequent use of the bougie is the only means of saving the patient from starvation.

(5.) CONGENITAL FISTULA OF THE NECK (*Fistula Colli Congenita*).—A very rare, imperfectly-described, almost problematical disease. I have never had an opportunity to see it. According to *Bednar*, it is indebted for its origin to the second or third gill-fissure remaining open. According to the same author, its external opening, in the environs of which the integument is firmly adherent to the subcutaneous cellular tissue, and forms a depression, is found in the lateral region of the neck, at a distance of half an inch from the clavicle and its junction with the sternum. Its internal opening either terminates in the head of the œsophagus, near the epiglottis, or in a *cul-de-sac* near it. The secretion of this fistula is a thick, tenacious mucus, and is discharged mainly during mastication and deglutition; water injected into it excites acts of deglutition.

All attempts to cure this deformity by means of cauterization have hitherto proved fruitless.

(6.) SCLEROSIS OF THE STERNO-CLEIDO-MASTOIDEUS MUSCLE.—In the first weeks of life a peculiar, cord-like thickening of one of the sterno-cleido-mastoid muscles occasionally occurs, the pathology of which is as yet by no means clear. The induration is evidently situated in the muscle, not over or near it, always occurs unilaterally, has a cylindrical, lead-pencil-like form, and is from one-half to an inch in length. In most instances the tumor is tolerably movable, becomes more marked during the pressure of the abdominal muscles upward (during the act of inspiration), and participates in all the movements of the muscle. *Paget* states that the face cannot be turned toward the affected side; in the three cases that have so far occurred to me, no perceptible functional disturbance of the muscle was noticeable. The etiology, as given by the French writers, who regard the induration as having simply originated from a difficult labor, the use of forceps, etc., is not applicable to my cases, for the delivery in all three cases took place without any assistance from art, and the tumor was not noticeable till a few days after birth. The supposition of its being a tumefied lymphatic gland is untenable, on account of its cylindrical shape, and the absence of glandular indurations in other parts of the body.

Treatment.—All authors, *Labalbary*, *Melchiori*, *Dolbeau*, *Paget*, *Wilks*, etc., unanimously agree that the tumor disappears entirely after a few weeks, under the external use of iodine, and this I am fully able to confirm from my own experience.

D.—*STOMACH AND INTESTINAL CANAL.*

(1.) THE MOST IMPORTANT SYMPTOMS OF GASTRIC AND INTESTINAL AFFECTIONS.—So many symptoms repeat themselves in the various diseases of the stomach and bowels, that it seems judicious to become thoroughly conversant with them before entering into a description of the individual diseases, which may then be studied more comprehensibly in an anatomo-pathological manner.

(a.) *Dyspepsia* (from δυςπεψία, difficult digestion).—By dyspepsia is meant a complete abolition or merely a diminution of the appetite; in the latter case the ordinary articles of food are despised, and the patient has only a desire for delicacies, of which, however, he consumes but very little. The appetite is the most authentic index to judge a general disease by, and the examination that has to be instituted in reference thereto embraces the most important and difficult part of the whole examination of the patient. The physician should never be satisfied with answers embracing general amounts, but should ascertain very accurately the quality and quantity of the nourishment consumed, should have the dishes shown him out of which the child is fed, see how much they contained before the meal, and how much remained, etc., for then only can a correct impression be obtained of the actual or imaginary decrease of the appetite.

Bamberger, in his work on the Diseases of the Chylopoëtic System, treats of the following four kinds of dyspepsia:

(1.) Dyspepsia from pathological alterations of the digestive organs.

(2.) Dyspepsia from quantitative and qualitative anomalies of the digestive secretion.

(3.) Dyspepsia from altered nervous influence, to which also the secondary digestive disturbances occurring in the various diseases belong; and,

(4.) Dyspepsia from abnormal irritation of the nutriments.

All these forms of dyspepsia occur in children just as in the adult. The first is the rarest; the second is very frequent, and accompanies principally the augmented evacuations from the intestinal canal, diarrhœa. The third is present in all acute febrile diseases, and supplies the best cardinal point in judging of the severity and duration of the fever, and the fourth is the most frequent disease in the whole Pædiatrica, from which the majority of artificially-fed children suffer the whole of the first year of life. That these different kinds cannot always be strictly distinguished from each other needs scarcely to be expressly stated, since, indeed, some are directly dependent upon and stand in the closest connection with each other.

In every dyspepsia the act of digestion is not only retarded, but also accompanied by numerous local and general difficulties. The undigested articles of food that have been lying in the stomach for some time constantly generate gases, which have a smell, allied, though only slightly, to some of the substances consumed, and which is to be distinguished from the odorless air that has simply found its way into the stomach by swallowing. The greater part of the gas first develops itself in the alimentary canal and distends it, by which pains are produced on touching the abdomen, or moving the body, which, as a rule, terminate with the discharge of a large quantity of flatus. Some children, suffering from disturbed digestion, complain also of a feeling of pressure, of fulness and pain in the præcordia, and a consecutive frontal or parietal pain almost invariably becomes superadded, which does not disappear until the appetite has returned. The usual and rapid termination of every dyspepsia, particularly if it is only caused by abnormal irritation of the food, is vomiting, after which the appetite returns, and the consecutive symptoms quickly disappear also.

Therapeutics.—The treatment of dyspepsia calls for a thorough examination into its causes, and, according to these, is sometimes radical, sometimes symptomatic, and then again merely expectant. The circumstances are often so complicated, the causes so difficult to fathom, that it is one of the severest tasks to establish general rational rules for it. The whole basis of treatment depends upon strict diet, or the deprivation of food, as rest in general, and of the diseased organs in particular, forms the first principle of therapeutics. Let the cause of dyspepsia be what it will, its effect is always the same—diminution or total abolition of the digestive ability—and the introduction of liquid, and, still worse, solid nutriments, is, therefore, under all circumstances, injurious. Where pathological alterations of the digestive organs exist, there, of course, no impression will be made upon the anorexia with any remedies, since it is only a result of the disease of the mucous membrane, and will persist as long as that condition does not assume a curative process. Dyspepsia caused by anomalies of the digestive secretions may often be quickly relieved by properly-selected remedies. It often happens, especially in artificially-fed children, as a result of the numerous articles of food which are not yet adapted to the infantile stomach, that a much more acid gastric juice is secreted than in those at the breast, and even when the diet has been regulated for a long time, so as to correspond with the age of the infant, this secretion still continues to be poured out in large quantities, causing dyspepsia and vomiting. This condition was known in the oldest times, and oculi cancrorum was prescribed for it, which, with justice, has been supplanted by carbonate of lime, of magnesia, or of soda. Which of these three remedies should be selected is almost wholly immaterial; they all neutralize the profuse, super-acid gastric juice in the same manner, and when a child has taken one or several grains of either of these remedies, for a few days, its appetite and digestion will be improved, provided the presumption of the cause was correct.

Some children are tolerably often attacked by icterus, and in the first few days suffer from complete anorexia. In many instances I have seen this disappear at once under the use of argent. nitr., which in children five years old may very appropriately be given in pill form, each pill containing one-sixth of a grain of the salt. After three or four pills the appetite will become reëstablished, although the icterus will remain for some weeks.

Dyspepsia which accompanies febrile diseases requires no special treatment; the instinct in children is still more potent and correct than in adults. Children with a really hot and dry skin and accelerated pulse do not touch the food that is placed before them, nor do they readily drink any nitrogenous fluids, such as milk or soups, but always call for cold water, and prefer it to sweetened and acidulous drinks. There is no remedy for this form of dyspepsia, and, even if there were, its use would undoubtedly be contraindicated during the duration of the fever. On the other hand, it frequently happens that by the too assiduous administration of remedies, such as tart. emeticus, in small doses, ipecacuanha, neutral salts, acids, etc., the digestion of children is interfered with and retarded longer than the fever would last, and the convalescence is thereby delayed.

In dyspepsia caused by abnormal irritation of the nutriments, the child is to be kept upon a strict diet for several days—nothing but mucilaginous broths, or milk mixed with chamomile-tea, should be given; afterward the child may be fed in the manner prescribed on pages 43 to 46. Calomel, in one-eighth-grain doses, given two or three times daily, exercises an extremely beneficial effect upon such an irritable mucous membrane; it produces a few green evacuations, the tympanitic, distended abdomen becomes smaller, rest and sleep follow, and the child begins to digest again.

(b.) *Bulimia* (from βουλιμία, ravenous hunger). *Polyphagia* (from πολυφαγία, greediness). *Fames Canina.*—A morbid increase of the appetite may, it is true, also be acquired through bad habits and a depraved rearing, but in children it is oftener a symptom of various morbid conditions, above all, of intestinal worms, next of hypertrophy of the mesenteric glands, and of chronic cerebral affections. The ravenous hunger coming on after acute diseases, particularly typhus fever, does not belong here, it finds its physiological explanation in the rapid replacement of the adipose tissues that have been lost. So also of that bulimia which originates in general good health, and without any disease of the organs, must an especial disposition be assumed; for, although very many children are constantly urged by their irrational parents to eat, and incessantly stimulated thereto by a change of delicacies, still few are able to acquire this rare condition. In these cases, the objects with which children seek to appease their ravenous hunger always belong to the class of delicate nutriments, but depraved longings, depending upon morbid alterations of the organs, also occur in greediness similar to that in pregnant women. Such children eat raw and bad victuals, and roots of all kinds, and refuse at no time of the day, not even directly after a meal, a slice of rye bread, of which they will consume as much as they can obtain. When this condition cannot be remedied sufficiently early, it becomes chronic, without the children increasing thereby in size and weight faster than those who are more moderate. On the contrary, they generally look pale and anæmic, have frequent evacuations, putrid-smelling stools, and are retarded in growth. At the autopsy, an extraordinarily large stomach, with thickened walls, and those morbid alterations already mentioned, are usually found.

Therapeutics.—The treatment is successful and rapid, if intestinal worms which may be expelled by the various anthelmintics are the cause of the polyphagia; but unsuccessful if, as in atrophic children, the mesenteric glands are collectively hypertrophied and infiltrated, or when a chronic hydrocephalus is the cause of the bulimia. Here we have to limit our efforts to supplying at least easily-digestible, bland nutriments; it will scarcely ever be possible to diminish them in quantity.

(c.) *Vomiting* (Vomitus).—Vomiting has frequently a different signification in children from that in adults. A great number of infants, as often as they have been nursed, throw up the greater part of the milk without any retching, without any distortion of the features, and without any consequences; this occurs all the more readily if they have been moved about or dandled up and down after nursing. This vomiting is very much facilitated in children by the almost total absence of the blind sac, the fundus ventriculi, on account of which the contents of the stomach are not, as in the adult, driven toward the fundus during its peristaltic action, but forced directly into the cardiac orifice, and, when that opening is incompletely closed, a regurgitation of the food will immediately take place. When the physician has an opportunity to see undressed infants vomit, he will readily convince himself that no abdominal pressure whatever takes place, but that at once, while the children are respiring normally, and displaying all the signs of perfect health, the milk flows quietly out at the mouth. They do not, on the whole, throw up very large quantities of milk, and thrive excellently in this condition, so that the old proverb of the nurses, " spitting children, thriving children," must be accepted as true.

This vomiting occurs only in infants at the breast; those brought up by the hand, it is true, also vomit very often, but here nausea, sleeplessness, and hot state of the body, precede the vomiting; the act itself is combined with retching and contractions of the abdominal muscles, and its effects are digestive disturbances of all kinds and emaciation. The matter vomited does not consist purely of the undigested nutriments, of the cow's milk, of the broth, or the soups, but a large quantity of mucus is already mixed with it, and the cow's milk is curdled into large lumps. Those who see a child of about five years old affected with nausea, consider it dangerously ill, near its death; the face turns deathly pale, the forehead becomes covered with a cold perspiration, the eye is heavy, the respiration profound, labored, and irregular; the pulse is so small that it is barely perceptible. It lays down and moans lowly; occasionally it puts its hands in the mouth, and bears an expression of the utmost anxiety upon its countenance. This condition may last several hours. Suddenly violent vomiting comes on, a large quantity of liquid food flows out of the mouth with a gush, a few retchings follow, accompanied by a loud outcry of the frightened child, and the whole morbid picture is instantly gone. Then, as a rule, a deep, long sleep succeeds, after which, if only an overloading of the stomach with coarse, undigested food was the cause, the child will wake up perfectly well, or at the most will suffer for a short time from a diminished appetite, and have a furred tongue.

When children are attacked by an acute exanthema, typhus fever, or pneumonia, vomiting of the last-enjoyed meal, as a rule, takes place in the first day of the disease; if that does not occur spontaneously, I limit myself to mechanical means to induce it; ipecacuanha and tartar emetic should never be used, because they invariably act upon the bowels at the same time, and diarrhœa only aggravates the diseases.

If a round worm has found its way into the stomach—an accident which happens but very rarely in children under one year of age, but in larger ones, on the contrary, tolerably often—then the acid contents of that viscus seem to disagree with it; it moves rapidly about and excites antiperistaltic actions and vomiting, by which, to the great horror of the inexperienced parents, it is expelled. No bad effects are usually observed from this; in general, however, such children are always afflicted with a great number of ascaris lumbricoides, and it is well to give them some vermifuge a few days after the vomiting.

The vomiting in acute cerebral affections, in commotio cerebri, and particularly in hydrocephalus acutus, is of a very peculiar character.

When children affected with these diseases are turned over upon the other side or set upright, then suddenly, without their becoming thereby unpleasantly affected, if they are otherwise in possession of their faculties, a gush of muculent, white, or yellowish-green water will come out of the mouth, after which, without suffering any retchings or nausea, they will take to drink again or continue to sleep. All cases should therefore be carefully examined and closely observed, whether nausea and retching precede the vomiting or not. When these symptoms do not precede, then we have to deal with very serious cerebral vomiting, from which the vomiting of healthy nurslings first spoken of, and which also occurs without retching, makes the only exception.

Treatment.—The vomiting of nurslings should not be interfered with so long as the nutrition of the child does not suffer therefrom, and no large quantities of milk are thrown up. But, when this is the case, the nursing of the child must be conducted in a different manner; it should not be allowed to drink until it forsakes the breast of its own accord, but should be taken from it after half that time, and laid down as quietly as possible. The crying that results therefrom soon ceases. By this procedure alone it is usually possible to prevent the too frequent and copious vomiting. If, however, this does not answer, a few teaspoonfuls of sweetened strong chamomile-tea should be given before the child is put to the breast.

The vomiting of artificially-nourished children is always a sign of enfeebled digestion, and is, under all circumstances, to be corrected. Here the treatment with carbonate of lime or carbonate of magnesia is excellently adapted, and leads, if in addition the diet is properly regulated, to the most satisfactory results. If the intestines are at the same time affected, if diarrhœa is present, these must be cured before a cessation of the vomiting can be expected. Here also, calomel, given in gr. one-sixth two or three times daily, stands at the head of the list of all known remedies.

When it is supposed that the child is nauseated, and only in consequence thereof is affected with restlessness and anxiety, then, for the mere purpose of inducing the act of vomiting, mechanical means alone usually suffice. The surest one is the direct compression of the stomach, which I accomplish by exercising a gradually-increasing pressure with the ends of the fingers from above the navel toward the præcordia, accompanied at the same time by a rotary motion of the hand, whereby usually violent, sometimes perceptible contractions of the stomach ensue. If this procedure does not cause vomiting, I introduce the right index-finger into the mouth, depress the tongue and tickle the soft palate. If no vomiting follows upon this manipulation, then it may safely and surely be concluded that the child has no nausea, and that an emetic will hardly produce any favorable change in the condition. If the physician believes he has seen very positive signs of nausea in a child, which could not be made to vomit by these means, four to eight grains of powdered ipecacuanha should be strewed upon the root of the tongue, the jaws being kept apart with the fingers of the left hand, after which a few teaspoonfuls of water are administered. If this quantity is insufficient, he may rest assured that the stomach has no contents that oppress it, and that by stronger emetics a vast amount of harm will be done.

The vomiting of cerebral affections is only symptomatic, and to my knowledge cannot be arrested nor even mitigated; when, in very rare instances, the acute hydrocephalus improves, the vomiting will cease spontaneously.

Vomiting that occurs in commotio cerebri, produced by a blow or fall, if no injury to the cranial bones nor cerebral hæmorrhage has resulted, lasts only one or a few days, and then gives place to a complete recovery.

(d.) *Flatulence and Colic.*—If the gas, that is always physiologically present in the stomach and bowels, increases in quantity, and the peristaltic movements of the intestines do not become accelerated to such a degree as to expel it by the anus, a distention of the stomach and bowels is produced, and, as a result thereof, an augmented tension of the abdominal walls, which, if acute, has been called meteorismus; when it has become chronic, flatulence, or tympanites. For this augmentation of gases the intestines are in greater part indebted to their own secretions; for at no time is it more constant than immediately before and during diarrhœa. Constipation, it is true, also tends to flatulence; it is, however, never so frequent nor so decided as that which accompanies diarrhœa. A diminution of the tone of the gastric and intestinal muscular coats is also always necessary, to produce a more intense degree of meteorism, without which the gases that originate would be quickly propelled toward the anus and be expelled; this happens principally in typhus fever, sometimes also in the acute exanthema. The nutriments with which children under one year of age are supplied—bread, milk, broths, and amylacea—never cause any flatulence so long as they are tolerated; but when diarrhœa comes on, then it cannot be decided whether the intestinal distention is a result of the nutriments or of the intestinal secretion.

Mechanical obstructions, carcinoma of the stomach or alimentary tube, strangulated herniæ, peritoneal adhesions, constricting cicatrices of ulcers, which in the adult cause such dangerous, almost fatal tympanites, occur but very rarely in children, in nurslings never.

Symptoms.—By flatulence we understand an enlargement of the abdomen, which may affect either the whole of the abdominal cavity or only some parts of it, according as the stomach and the whole of the alimentary canal, or only certain sections of the latter, become distended.

It is usually assumed that, when the abdomen has a conical shape, the small intestines are dilated, when it is barrel-like distended, the large intestines are expanded, in which case, however, a complete cut-off would certainly have to exist between the large and small intestines, since air in spaces that communicate with each other must effect equal tension, and uniformly expand their boundaries. That such a complete cut-off ever takes place at the ileo-cæcal valve is not probable, but an inequality in the tone of the muscular coat of the large and small intestines is very likely to happen.

In acute diseases, particularly in abdominal typhus, the condition becomes materially aggravated by the tympanitis, for the lungs and heart thereby become compressed, and thus dyspnœa and disturbance of the circulation are liable to ensue.

Colic is a pain that originates in the walls of the intestines; it is mostly paroxysmal and exacerbating. It is, of course, only a symptom, in fact, of the most varying diseases of the abdomen, but flatulence is its most frequent causation, of which colic is the most constant symptom. In addition, colic pains occur in children, with every diarrhœa that has originated in consequence of anomalous irritations of nutriments, and are never absent when material alterations of the intestinal mucous membrane, when enteritis folliculosa or dysentery, even in their mildest forms, have once developed themselves.

Large quantities of round worms may produce violent colic pains; single round worms frequently pass off from the children, having produced no colic pains whatever, nor displayed any symptoms in particular, as will be shown more fully further on, in the study of entozoa. There are also some children, who, every time they have caught a cold, especially if their feet have become wet, are suddenly attacked by colic, without the digestion before or during it being materially interfered with. Such children usually do not tolerate baths, nor even ablutions with cold water, but often for years have to be washed with warm water, and then only with the utmost precaution.

The symptoms are usually as follows: Sudden painful contractions of the angles of the mouth and of the countenance in general, sudden loud continuous crying, restless movements of the arms, stamping with the feet, contractions of the lower extremities upon the body, painfulness of the abdomen, increased on touching, and tympanitis; in boys the scrotum is in a state of extreme contraction. Generally a discharge of gases or of fluid fæces soon takes place; vomiting, also, frequently follows. In very nervous children, and when the colic is of an extreme degree, convulsions may ensue. The principal cardinal points in the diagnosis are the complete intermissions of the pain, and the preceding digestive troubles.

After all, the physician should never depend upon the statements of the parents, who are very much given to exaggerate every restlessness of the child into colic pains; he should cause the child to be completely undressed, and uninterruptedly watch it for ten or twenty minutes, and carefully examine it. Many mothers look upon the colic-cry as a hunger-cry, and hasten to fill the mouth of the child with milk, or even broth, and, what is very remarkable, they often succeed in quieting the child with a few teaspoonfuls, but only for a few minutes, and then, in consequence of the irritation produced by the newly-introduced food, it sets up a still louder and longer cry.

Therapeutics.—The treatment of flatulence has for its object the expulsion of the gas from the alimentary canal, and this is best achieved by clysters. In most cases an ordinary injection with warm water, to which a few teaspoonfuls of oil have been added, suffices; should no copious evacuation of fæces and gas follow, a clyster of cold water, without oil, or of a strong warm infusion of chamomile, may be tried; the former tends to produce a sudden acceleration of the peristaltic action of the whole intestinal canal, which is often accompanied by manifestations of pain, and is therefore not appropriate when the colic preponderates; the latter, on the contrary, is principally directed against the colic pains, and acts more as an anti-spasmodic than as a gas evacuant. Bladders filled with ice or cold water, or compresses applied to the abdomen, so much advocated in adults, act very unfavorably in small children, and aggravate the pain, without being followed by any relief. Temporary benefit can only be derived from such a method of treatment; an impression upon the causes of the flatulence cannot be made until the entire nutrition of the child has been examined, and the action of the various articles of food accurately observed. Through this examination it becomes evident, as already stated, that the diarrhœic intestinal secretion generates large quantities of gas before it is evacuated, and consequently all articles of food, which cause the children slight diarrhœic stools, produce directly also flatulence; the most common preparations that belong to this category are the gruels, and especially all those prepared with cow's milk, and amylaceous broths; children at the breast rarely suffer from flatulence. It follows, that children about to be brought up by hand, who are predisposed to colic, must soon be habituated to meat-soups, which at first should be given slightly sweetened, and but once a day; later, twice daily, and without any sugar. I do not consider it necessary to restrict children to any particular kind of meat—veal and chickens are unnecessary luxuries—the main thing is that the soups are not too concentrated nor salty, and should be freed from oil-globules as much as possible. The best material to give the soup suitable consistence is pulverized wheat bread; rice, groats, and mucilaginous soups are not tolerated long.

During the attack, colic requires a symptomatic, and, subsequently, a causative treatment. The symptomatic treatment consists either in a cautious employment of narcotics, particularly the preparations of opium, of hydrocyanic acid and nux vomica, or in ethereal, aromatic remedies, chamomile, peppermint, or melisa teas, applied per os et anum. Above all, it is necessary to keep the patients warm; this is readily accomplished by wrapping them up in warm clothes, by applying to the abdomen bottles filled with warm water, or bags filled with warm chamomile-flowers; warm drinks are also very beneficial.

The causative treatment has for its object the removal of the different causes:

(1.) Colic produced by anomalous contents of the stomach and alimentary canal. Here, if possible, the stomach should be evacuated by mechanical means, or, if not, by four to eight grains of ipecac. When coarse, indigestible nutriments have once passed beyond the pylorus, they will produce diarrhœa by their own irritation, and there will hardly ever be any occasion to induce it by remedies; on the contrary, it often happens that the diarrhœa has to be arrested by constipating remedies, because it has become too profuse. Worm-colic must be treated first by opium, to palliate the colic; then, however, by proper doses of anthelmintics to expel the worms, a more detailed description of which will follow further on. Vermifuge remedies should never be given to a child suffering from diarrhœa and colic.

(2.) Colic caused by impaction of stagnant alvine masses, owing to their generally rapid digestion and absorption, rarely occurs in children. But fruit-seeds, especially of grapes and cherries, accumulate into large lumps, and the stools, notwithstanding the fruits partaken of, remain hard, and, if a large quantity has been swallowed, intense colic pains, and even symptoms of intestinal stenosis, will follow. As these lumps of fruit-seeds almost always remain in the small intestines, clysters therefore do not suffice to remove them; an augmentation of the intestinal secretion must be obtained, to soften and make them liquid, for which purpose a few large doses of calomel, of four to five grains, will be found to answer.

(3.) Colics depending upon textural alterations of the alimentary canal only require a symptomatic treatment, as has already been stated above; the treatment of the textural diseases will be given more in detail in connection with their descriptions.

Lead colic, arsenial colic, and all other toxical colics in general, must be treated as in the adult, by the respective antidotes which toxicology prescribes.

(e.) *Diarrhœa* (διάῤῥοια, from *dia*, and ῥέω, I flow).—By diarrhœa we understand a qualitative and quantitative derangement of the excrements. The quality of the excrement evacuated is, aside from the chemical and microscopical properties, subsequently to be elucidated, in so far changed that it no longer possesses the semi-solid, pap-like consistence, but is now a watery liquid alone, or watery liquid in which fecal matter or remnants of food are suspended. The quantity is always increased in diarrhœa, but no very precise amounts can be given, because, in the infantile age the stools cannot be properly collected, and the measurements give therefore only an approximative result; the eye-measurement, however, suffices completely to confirm the statement that a larger quantity of alvine matter is evacuated in diarrhœa than in the normal state. That the anus has to open itself oftener than usual, in order to expel a larger quantity of excrement, requires no further comment. Owing to the irritation which the liquid alkaline intestinal contents exercise upon the sphincters, the defecation takes place oftener even than would be absolutely necessary in conformity with the total quantity of the fæces evacuated.

Various kinds of stools may be distinguished, according to the form, color, and smell; and furthermore, according to the chemical and microscopical properties.

The normal form of the infantile fæces in the first year of life is the pappy; the color is yellow, like that of the yolk of egg; the smell is feebly acid, never putrid, and, only in children who are fed upon a meat-diet, as repulsively pungent as in the adult; in later years they are no longer to be distinguished from those of the adult.

Diarrhœa may consist simply of softer, more fluid, but yellow-dyed, and still feculent matters—diarrhœa simplex, stercoralis sive fusa—or undigested articles of food pass off with such constituted stools, a condition that has been called diarrhœa lienterica, lienteria (from λεῖον, smooth, and ἔντερον, intestines, lævitas intestinorum). These occur extremely frequently in artificially-brought-up children; for the careless parents try from time to time whether they might not finally cease preparing extra dishes for the child, and allow it to eat from the general dish. They give the children meat, vegetables, and fruit. Occasionally, finely-cut pieces of meat are digested; as a rule, however, the children, for want of teeth, swallow larger pieces, which the gastric juice is incapable of dissolving, and these now pass through the whole of the intestinal canal as foreign bodies, and undergo decomposition. Vegetables and raw fruit are generally discharged in an undigested state, and often cause a very profuse, dangerous diarrhœa, sometimes none whatever.

Again, there are diarrhœæ where the bright-yellow evacuations are so thin that they squirt out from the anus as from a syringe, and, like water, soak through the diapers and bedclothes. They occur principally in cholera nostras and asiatica, and in children who have only been just weaned, diarrhœa ablactatorum; they are either totally odorless, or have a putrid but never the physiological acid smell, and never react acid, like the normal stools of children at the breast, but neutral, sometimes even alkaline, from the presence of large quantities of the alkaline carbonates. If they have been collected in a clean vessel, and then poured into a test-tube, they will separate into two strata, after the manner of typhus-fever stools; the upper one is bright, almost perfectly transparent, the lower flocculent, and mixed with small brown feculent lumps; this lower layer is often very small, and forms but a tenth part of the upper. The microscopic examination, besides the undigested remnants of food, such as vegetable cells, amyloid bodies, milk-globules, casein-coagula, etc., reveals nothing but intensely yellow or light-brown-dyed scales, fragments of epithelium-cells, and a number of brown globules of various sizes, without enveloping membranes, as may be readily demonstrated by simply compressing them; entire cylindrical epithelium-cells are rarely seen. In alkaline stools the triple phosphates are also found. Generally these stools do not contain albumen, but when they have a rose or reddish-brown color, usually due to an admixture of small quantities of blood, then albumen may easily be detected by the aid of nitric acid.

The green stools of children are commonly denominated "bilious," but without any correct foundation, for nobody has yet demonstrated that they contain more component parts of bile than yellow or brown stools. The coloring matter of the bile is originally brown, and the normal fæces on that account brown; or, if the children are only fed upon milk, golden yellow. But the normal brown coloring matter of the bile (the biliphæin) can very easily be converted by a number of chemical agents, even by simple contact with air, into the green (biliverdin), and this, in the medication of children, very frequently happens through calomel. The supposition that the green stools, after small doses of calomel, are due to a mechanical admixture of a substance covered with a black coating of sulphuret of mercury, is erroneous; for (1.) These green-colored stools often last for several days, and are of large quantities, without it being possible to demonstrate the presence of mercury in them after the second day; and (2.) The stools may be diluted with water, and filtered, when the latter will be seen to run through the filter very green in color, proving conclusively that it is not a mechanical coloring.

In young children green stools occur during dentition, and after almost every intestinal catarrh produced by undigested nutriments, and it seems that the augmented secretion of the intestines is sufficient to convert the biliphæin into biliverdin. It also very frequently happens, that the fæces are evacuated perfectly yellow, but turn to a green color when exposed to the air for a few hours. This change of color first begins at the periphery and on the thinner layer of the fecal masses; and not till some time after do the denser, principal lumps become affected, until the whole is seen to be dyed uniformly green. Children with such evacuations usually suffer from slight digestive disturbances.

In still another kind of diarrhœa, admixtures of large quantities of mucus occur, large and small lumps and shreds of which being discharged with the almost liquid intestinal secretion, having the greatest resemblance to the glairy nasal mucus. They may be tolerably well freed from coloring matter by agitating them with water; they lose, however, thereby, in transparency, and under the microscope exhibit mucus-corpuscles, fragments of epithelium, and granular masses. The evacuations of these are attended by pain.

In artificially-reared, slowly-developing children, gray or bright-yellow colored, loamy stools are sometimes met with, which may be smeared like moist clay upon the diapers and with the greatest exertion only are expelled from the anus. This decoloration is due to a deficiency or absence of bile, or at least of the coloring matter of the bile, and, so far as I am aware, has no deleterious effect upon the digestion and development in particular. True, by the aid of the extract, or a few grains of powdered rhubarb, an increased secretion of bile may readily be obtained; the danger, however, is always thereby incurred of inducing an intestinal catarrh, the end of which it is impossible to foresee; consequently more harm may be accomplished by it than good.

The odor of the diarrhœic fæces will always be of the greatest importance in judging the disease of the mucous membrane, and particularly for the prognosis. Of a number of stools, having the same appearance and the same degree of fluidity, some will have scarcely any odor, others will smell simply fecal, and still others *fetid* and *putrid.* These last are always symptomatic of a grave disease, of enteritis folliculosa, which in most instances terminates in death. The odor is difficult to be described, but may be best compared to sulphuretted hydrogen; it is often so offensively pungent, that the care of such children can only be properly carried out by great sacrifices on the part of the attendant, the rest of the occupants of the room in which the child is confined being obliged to vacate it. These stools are also evacuated with pain, and redden the anus and its adjacent parts. Most frequently they are met with as accompaniments of thrush, in which the anus, genitals, inner part of the thighs, and heels, appear intensely reddened, and, in parts, also eroded. Microscopically and chemically, I could detect no special distinguishing characteristics in these stools, and, with the exception of the odor, know no pathognomonic peculiarity to mention.

Pus probably never occurs in the stools of small children; in those of larger ones it may sometimes be seen after dysentery has been arrested. Most tubercular ulcers of the bowels are situated in the small intestines, and their discharges are not so copious that whole streaks of pus, for these only are meant, can be found in the stools.

(f.) *Obstipation* (*Obstructio Alvi*), *Constipation.*—When otherwise healthy children, under one year of age, have not two evacuations, and those from one to three years at least one stool a day, the consistence of the fæces becomes hard, and a condition results that has been called obstructio alvi. Artificially-reared infants are mainly subject to it; still it is also sometimes seen in children at the breast, especially in those whose wet-nurses suffer from this evil. The chemical investigation of the milk of such wet-nurses leads to negative results.

The *causes* of constipation are found in the following conditions:

(1.) Deficient or too tenacious intestinal mucus. The constipation of most febrile affections is mainly due to this condition, or to augmented perspiratory and urinary secretions.

(2.) The nutriments, especially the amylaceous class, soups containing meal, rice, sago, etc. In older children the various dishes consisting of beans, peas, and the like. Again, all nutriments and medicines containing astringents, red-wine, the preparations of lead, alum, iron, bismuth, chalk, nitrate of silver, and vegetable remedies containing tannin; all these may produce constipation, which will last for some time.

(3.) Too slight peristaltic movement of the alimentary tube, which is scarcely ever observed as a primary but mostly as a secondary condition, the effect of disease in other organs. Here belongs the obstinate constipation of acute hydrocephalus, in which, notwithstanding its long duration, the abdomen always remains depressed. In atrophied children, in ultimo stadio, besides the diminution of the intestinal secretions, atrophy of the muscular coat of the bowels becomes superadded, and then constipation ensues through a double cause, and finally a peripheral paralytic state of the bowels also occurs, especially in mechanical or perforative peritonitis.

(4.) Mechanical obstructions, incarcerated herniæ, intussusceptions, tortions, complete occlusion of the calibre of the gut by firm, dry stercoraceous masses, etc., occur extremely rarely in children. In new-born children, imperforatio ani, a description of which will follow further on, must be taken into consideration.

The description of the symptoms is almost exhausted by the definition of the malady. The abdomen is distended, but, in simple constipation, not painful to the touch. The sparsely-evacuated fæces lay dry in the diapers, like those of the goat or sheep. When the evil is of long standing and intense degree, the tympanitis increases so much as to push the liver upward; the spleen cannot be detected by percussion, and the whole abdomen feels as tense as the head of a drum, on account of which, it will naturally be painful to the touch. Then the children leave off eating, are very restless, attacked by eructations, and finally by vomiting, some fetid intestinal gas passes off, with slight temporary relief, but all the symptoms disappear at once, if one or more copious evacuations have been produced.

When the disease is of long duration, the tympanitis becomes chronic. Owing to the protracted anorexia the patients become very much reduced, and, as a result of the continuous compression of the abdominal veins, a marked collateral venous circulation forms beneath the abdominal integument.

In every serious constipation it is advisable to examine the anus and rectum with the finger, because we may thereby often dispense with the internal treatment. Hernia is frequently the effect of this evil; and convulsions in small children. If no mechanical insurmountable hinderances, as those enumerated in sec. 4, are present, the prognosis may be regarded as favorable.

Therapeutics.—The treatment must fathom the cause; therefore, the diet is, first of all, to be tested and regulated. A slight modification of the nutrition often suffices to relieve the evil, as, for instance, meal food is to be allowed only once instead of three times a day to the child, and more milk given than heretofore, or the very constipating mucilaginous soups are substituted by thin beef broths with some wheat bread, which is made to form the staple of the daily nutriment. In somewhat older children the stools may be readily augmented by allowing them boiled and also raw fruits, grapes, apples, pears, etc.; next by a plentiful supply of cold water, and it is especially advisable to try to remedy the constipation by a change of diet, before aperient remedies, of whatever kind they may be, are resorted to. If no success has attended this simple method of subjugating the evil, one or two teaspoonfuls of ℞. rhei aquosa should be given, as it is always the best and least injurious. Calomel should never be resorted to for the mere purpose of promoting the stools, when no other indication for it exists, for the very reason that mercury cannot be cleared of the suspicion that it tends, in many cases, to retard the development of the child, and promotes caries of the teeth. A small suppository of common soap introduced into the rectum will frequently relieve the constipation. Clysters of cold water or of soap-water have the double effect of softening the hard fecal contents of the rectum, and, by consensual irritation, of stimulating the whole intestines into increased peristaltic action, and of augmenting the secretions thereof. But when the fecal masses are very compact, it will not be possible to employ clysters, for the water will flow out again even during the injection, and we have no other alternative but to remove them by mechanical means, by the aid of a hair-pin, scoop, or the like. Constipation accompanying febrile diseases, and that originating as an effect of acute hydrocephalus and of peritonitis, very seldom become objects of special treatment, and will be spoken of in the relative sections.

(2.) Catarrh of the Gastric Mucous Membrane (*Catarrhus Ventriculi*).—Catarrh of the mucous membrane of the stomach, or gastritis catarrhalis, is met with in the autopsies of many children, who, during life, exhibited no signs whatever of disturbed digestion. When we bear in mind that a bright-red color of the gastric mucous membrane is a *physiological condition* in the new-born, it will not be possible to lay very great stress upon the frequently-described injections, and still more of the ecchymosis of that mucous membrane, especially as we have no guide whether any, and, if any, what symptoms are produced thereby. Only when a blennorrhœa of the gastric mucous membrane has developed itself, and the profusely-secreted mucus is vomited several times a day, are we justified, from a clinical point of view, to diagnose a gastric catarrh. The causes of this affection are as numerous as those which have been enumerated in the previous sections for dyspepsia, vomiting, flatulence, etc.

Symptoms.—The symptoms of such a gastric blennorrhœa are fixed, continuous stomach-ache, increased on pressure, permanent distention of the epigastric region, perceptibly increased temperature of the same, and an accumulation of gas within the stomach. Warm or solid nutriments and warm drinks, introduced into the stomach, aggravate the pains; cold drinks, particularly cold milk, relieve them. True, the food is frequently thrown up, but upon that alone the diagnosis of gastric catarrh cannot be based; an emesis of pure, opaque, glairy, or greenish mucus, without much retching, must take place before or some hours after the meal. The nutrition of the child is not much interfered with at first, because, as has been already observed, the food is not regularly thrown up, and the intestinal mucous membrane is still capable of absorption. But in the course of time emaciation comes on. In the cadaver the gastric mucous membrane is found hypertrophied, covered with a thick layer of mucus, its upper surface uneven and warty, a condition that has been called *état mamelonné* by the French; but it is only necessary to observe here, that, before a mucous membrane can be called mammellonated, the contracted stomach should have been stretched out to its fullest capacity, for, in the strongly-contracted stomach, every mucous membrane, even the healthiest, will assume a warty appearance. The rest of the symptoms enumerated in text-books, those regarding the pulse, the general condition, the stools, the urine, etc., are not sufficiently characteristic to deserve a place here.

Therapeutics.—The chief object of the treatment is to regulate the diet, and nothing but cold milk should be allowed for several days. Against the profuse secretion of the mucus, nitrate of silver has proved to be a sovereign remedy. To small children under one year and up to two years of age, I give a solution containing nitrate of silver, gr. ss. to water ℥ iij, without syrup, or any mucilaginous addition. To children several years old who are adepts at swallowing pills, $\frac{1}{6}$ gr. nitrate of silver each will be found to act better than the solution. I recollect but a single instance, that of a boy eight years old, in whom I was unable to accomplish any satisfactory results with this method of treatment. For ten days he took four to six nitrate-of-silver pills without any effect, whereupon I ordered him five drops of creosote in five ounces of mucilaginous vehicle, and, to my great surprise, the vomiting of mucus was suddenly arrested by it. Nitrate of silver, cæteris paribus, will always be preferable to the creosote, owing to the unpleasant odor and disagreeable taste of the latter. Compare the treatment of vomiting, page 130.

(3.) Toxic Inflammation of the Stomach.—All children are lickerish, and junket whenever they get a chance, and thus it not unfrequently happens that children from one to five years of age, especially in manufacturing cities, where a great deal of strong acids and caustic alkalies are used, hurriedly swallow large quantities of sulphuric or nitric acid, caustic alkali, caustic lime, common lye or carbonate of soda, and a considerable quantity may have already found its way into the stomach, before they become aware of their disastrous error. The discussion of the general effects of caustic poisons belongs to the forum of Toxicology; we will therefore limit ourselves to a description of the morbid changes of the stomach and intestines.

Symptoms and Anatomo-pathological Characters.—The state of the mouth is the surest index by which to judge of the lesions within the stomach. Its mucous membrane, from any concentrated caustic, is found converted into a whitish-gray mass, on the removal of which the submucous tissue is seen to be dark-red, and sometimes bleeds considerably. Only in case nitric acid has been swallowed will the mucous membrane be dyed yellow, and less softened than shrunken. If a large quantity and very concentrated caustic has been introduced into the mouth, the submucous tissue will also be implicated in the destruction, and, at the first sight, one may be led to believe that he has a diffused gangrene of the mouth before him, as in noma, for instance. A similar condition is found in the stomach. The milder degrees of cauterizations with weaker escharotics, or when such small quantities have been swallowed that, by becoming diluted with the gastric contents, they are barely capable of acting as escharotics, will hardly ever offer an opportunity for an anatomo-pathological examination, for the lethal termination takes place, if at all, at a much later period, but in most instances does not follow at all; in those cases that prove rapidly fatal the mucous membrance is found destroyed, in black shreds, the muscular and serous coats lax and usually perforated, and the contents of the stomach already escaped into the peritoneal cavity. Even the duodenum may be encroached upon by the caustic, but the morbid appearances of the bowels, in comparison with those of the stomach, are very slight. Death, by perforation of the stomach, happens less frequently in lickerish children than in suicides, who with premeditation swallow a large quantity of corrosive liquid, but gastric and œsophageal ulcers will frequently ensue (vide Œsophagitis, page 122), which heal but very slowly and with hard cicatrices.

The symptoms accompanying these accidents vary according to the quantity and strength of the escharotic, according to the depth it has penetrated into the stomach, and according to the quantity of liquid food or fluids present in the stomach at the time. Usually, immediately upon the introduction of the caustic into the mouth, retching and a spasmodic closure of the œsophagus take place, as a result of which it does not enter the stomach at all, but is expelled again by the mouth. The case is far worse when the stomach has also become corroded. The patients then lie in the greatest suffering, and stir very little, because the intense gastric pains become still more aggravated thereby, and a bloody saliva, sometimes mixed with black vomited lumps, flows constantly from the mouth. The patients are completely aphonic; every act of deglutition induces the renewal of violent pains, or even syncope and convulsions; a cold perspiration covers the face, the eyes roll anxiously about, sink deep in the orbits, and are surrounded by a wide dark circle. The pulse is small, scarcely perceptible, and the surface of the body cyanotic. If the escharotic has come in contact with the alimentary canal, bloody diarrhœa will also supervene. If the phenomena have attained the above high degree of severity, death soon takes place, generally from perforation of the stomach; and, even if the latter does not happen, it apparently occurs in consequence of paralysis of the pneumogastric nerve. When death does not ensue in the first few days, recovery usually takes place after months of suffering, attended by alarming emaciation. Abnormal agglutinations, changes in form, and formations of diverticulæ or strictures, may nevertheless be left behind for life.

Therapeutics.—The treatment in poisoning with caustic or alkaline carbonates is to neutralize them as quickly as possible by the aid of diluted vegetable acids, i. e., vinegar, lemon-juice, or the like, or to saponify them by administering some fatty substance, such as almond or olive oil, which should be administered in cupfuls. Either of these agents may be found in every house, and therefore there is no necessity whatever to previously administer mucilaginous substances, the effects of which are by no means certain; still less are emetics indicated, since spontaneous vomiting always occurs without them, besides which the violent contractions of the stomach, induced by emetics, enhance the ultimate occurrence of perforation.

Corrosive acids likewise require to be neutralized as rapidly as possible, and for this purpose magnesia usta is best adapted; but, as this article is not often found in dwellings, it has to be sent for; consequently, a certain amount of time is lost, which may cost the child its life; it is best, therefore, to administer soap-water or scraped chalk: in the use of these, however, a large amount of carbonic acid is generated, which, before being expelled by eructations, may induce a dangerous distention of the stomach. Ashes and common lye should only be used with the greatest precautions, and greatly diluted, otherwise they may themselves produce further erosion. If the threatening symptoms have been palliated by the means here prescribed, opium will then be the best and most rational remedy to assuage the pain and arrest the peristaltic action of the stomach. As many drops, less one, of laudanum are to be given as there are years in the age of the child, and this dose should be repeated every two hours till rest and slight narcotism ensue. In these accidents cow's milk has proved to be the best nutriment, upon which even older children may subsist for many weeks; at first it may be given cold, and afterward to suit the taste.

(4.) THE PERFORATING ULCER OF THE STOMACH (*Ulcus ventriculi rotundum sive perforans*).—The perforating ulcer of the stomach is of extremely rare occurrence in children under ten years of age; on the other hand, it frequently becomes developed in chlorotic girls before the commencement of puberty. Consequently, we have not strictly to treat of a disease of childhood; we therefore only mention it for the purpose of enabling one to exclude it in a doubtful diagnosis of a gastric affection in a child under ten years of age. But when older children, especially girls, suffer from it, then its symptoms, pathological anatomy, termination, and treatment, differ in no respect from what is observed in the adult. We therefore refer the reader to the classical works of *Rokitansky*, *Cruveilhier*, and *Bamberger*, in whose work on "Diseases of the Chylopoëtic System" an exhaustive description of this condition may be found.

(5.) HÆMORRHAGIC EROSIONS OF THE GASTRIC MUCOUS MEMBRANE.—In many autopsies of children, who have died from the most dissimilar diseases, a varying number of minute extravasations of blood are seen upon the gastric mucous membrane. They appear either as round spots, from the size of a millet-seed to that of a pea, or as long, narrow streaks, and are situated upon the most elevated portions of the congested mucous membrane. At these points the mucous membrane is either of a livid color and bloody in appearance, or, if the disease has been of some duration, it will present the shallow depressions resulting from loss of substance. Brownish-red fibrinous flakes generally cover such spots, and the lesions described are only brought into view after they have been removed. I have never met with an instance where the submucous and muscular coats were involved in the erosion.

These erosions are most frequent and numerous in the pyloric region. Whether they originated in the glands of the gastric mucous membrane, on account of which *Cruveilhier* would have this affection denominated *gastritis folliculosa*, it is impossible to decide, in the cadaver, as the ecchymosis does not limit itself to single mucous follicles, but is diffused over large surfaces in round or oblong patches.

The symptoms conformable with the fact previously stated, that the erosions may be found in the stomachs of children who have died from the most dissimilar diseases, are very unreliable and insufficient. They are frequently met with in tuberculous and atrophic children. They also often occur in children who have been treated with antim. et potass. tart. and other emetics, as well as drastic purgatives, or who, toward the termination of their last sickness, suffered from spontaneous vomiting. On the whole, however, it would be too presumptuous to say that they might not be found in children in whom none of these conditions had existed, and who die from such different diseases as lobular or lobar pneumonia, pyæmia, etc., so that it is difficult to mention any symptoms of this *post-mortem* condition which would indicate its existence during life; consequently this affection has only an anatomo-pathological interest.

APPENDIX.

SOFTENING OF THE STOMACH (*Gastromalacia*). — Softening of the stomach is not a disease, but only a *post-mortem* condition; but, since many authors and experienced physicians still doubt its *post-mortem* origin, the explanation of the condition will be given, further on, more minutely than its simplicity in reality seems to require.

Before the appearance of *Jäger's* article, softening of the stomach was regarded by all as a *post-mortem* condition, a *self-digestion* of the stomach occurring after death; in this sense it was that *Morgagni* and *Hunter*, later *Armstrong*, *Treviranus*, and *Carswell*, wrote on it. Then *Jäger* came forward, in 1811, with his discovery of *a new disease*, *softening of the stomach*, which he described in several articles published in *Hufeland's Journal of Practical Medicine*. The symptoms of the new disease, as *Kreuser* afterward very correctly pointed out, were identical with those of common cholera infantum. It first manifested itself by fever, irregular breathing, pain in the abdomen, intense thirst, anorexia, vomiting, and diarrhœa, to which, in a very short time, extreme emaciation, constant restlessness and sleeplessness, coldness of the face and extremities, and death, almost invariably succeed.

It was not long, however, before it was found that this group of symptoms was not adapted to all gastromalaciæ discovered at *post-mortem* examinations, and the affection was therefore divided into two forms, an acute and chronic. For the acute the symptoms just described were retained as correct, death following on the seventh or eighth day; the transition of the acute into the chronic form was said to take place as early as the fourth day. This latter form, however, it was claimed, in addition, might be developed by symptoms which at first were very slight, the subjects at last apparently perishing from atrophy. As almost every child in the course of its life has had one or more attacks of vomiting and diarrhœa, it was therefore very convenient, as often as this *post-mortem* softening of the stomach was found, to constitute the chronic form. That in a large number of children, who died from acute summer complaint, the so-called cholera nostras, no trace whatever of gastromalacia could be found, was ignored for a long time. Later on, however, doubts, as to whether there was any connection between the pathological condition and the artificial complication of symptoms, increased to such a degree that they finally received due attention. Among these, first of all, was *Virchow* and his pupils; next *Engel*, *Bednar*, *Oppolzer*, *Bamberger*, *W. King*, and *Trousseau*. These were, and in part are still, opposed by a number of German and French physicians, who, according to *Bamberger*, may be classified in the following groups: *Louis*, *Lallemand*, *Billard*, *Richter*, and *Nagel*, regard the softening as a product of inflammation. *Andral*, *Cruveilhier*, *Berndt*, and *Winter*, believe it originates from an altered condition of the secretions, as well as from irritation and congestion. *Jäger*, *Camerer*, *Authenrieth*, *Schönlein*, *Naumann*, *Most*, *Teuffel*, and others, attribute it to an altered state of the nervous system, a neurophlogosis, or neuroparalysis. Even *Rokitansky*—at least in the older editions of his Pathological Anatomy—considered this as probable, and, in addition, assumed for another list of cases degeneration of a dyscrasic nature. *Canstatt* seeks for the cause in an altered state of the gastric secretion, and *Eismann* even attributes it to a peculiar miasma.

Lastly, there are a large number of physicians who would side with both parties, for they grant that the softening of the stomach was commenced during life, but claim that it reaches the highest degree, and even perforation, only after death. To these *Chaussier*, *Meckel*, and, in part also, *Andral*, belong.

Elsässer, in a monograph published in 1846, threw the most light into this complicated dispute. In it he demonstrated why, and under what conditions, the softening takes place in one cadaver and not in another. But before we enter more minutely upon the reasons for the cadaveric nature of the gastromalacia, it would be best to describe its anatomo-pathological condition.

By gastromalacia we understand that morbid alteration of the stomach, in which its coats are softened or destroyed either by an ulcerative process or by the formation of pseudo-plasma, independently of any inflammatory action whatever. The seat of these alterations, in the great majority of cases, is the blind sac or fundus, and, by preference, its posterior wall. Why just these parts should be most frequently attacked is manifest from the dorsal decubitus in which the infantile cadavers are always placed. The mucous membrane is always the first of the tissues attacked; not till this membrane is destroyed does the process invade the muscular and then the serous coat. These conditions may be readily and clearly demonstrated at the points of transition, from the softened parts of the stomach to those which have remained uninjured.

Two kinds of softening have also been distinguished, a *gelatiniform* and a *black*. In the gelatinous form the affected places are changed to a yellowish-green, jelly-like tissue, and in the black into dark brown or blackish. The dark or bright color depends entirely upon the larger or smaller quantity of blood in the stomach at the time death took place. The more vascular the gastric coats are, the darker will the softened places appear. Sometimes the softening limits itself so precisely to the mucous membrane and submucous tissue, that the muscular coat appears as if exposed by the anatomist; but when this coat also is destroyed, then the serous coat, the only one intact, assumes a gauze-like appearance, and readily tears in the attempt at removing the stomach from the abdomen. In other instances the stomach has ruptured before the abdomen is opened, and its contents escaped into the peritoneal cavity. But it should here be borne in mind that no reaction of the peritonæum, congestion, or purulent effusions, have ever been found in such perforated stomachs.

No well-defined limits of the softened parts are ever noticed, as they gradually become superficial and lost in the normal mucous membrane without any inflammatory or even congestive demarcation. As regards the contents of the stomach, *Elsässer* was the first to call attention to the fact that a softened stomach *is never* found empty—that is, filled only with mucus, and that the liquid food always present has a strong acid reaction. In the majority of softened stomachs the contents consist of curdled milk. Often those organs adjacent to the stomach become implicated in the softening without perforation having taken place. The spleen, the left half of the liver, the diaphragm and œsophagus, may be affected with the softening; and thus if the latter, from rough handling of the corpse, has burst, which often occurs, the liquid food will be found to have escaped into the left pleural cavity. Even softening of the pulmonary tissues and liquid food in the bronchi have been observed. This will have to be explained by the supposition that, while the infantile corpse was moved about or raised for the purpose of cleaning, some of the gastric contents flowed back into the pharynx, and then through the glottis down into the bronchi, where this material, causing softening, begins to act the same as in the stomach. Moreover, in most cases, morbid changes are found in the rest of the organs sufficient to explain the cause of death. The following reasons may now be advanced for the *post-mortem* nature of the gastromalacia and for its non-existence during life:

(1.) Softening of the stomach always affects the most dependent part of that viscus, in which, according to the laws of gravity, its contents accumulate; therefore, under ordinary circumstances, in the dorsal decubitus of a corpse, the fundus, and by preference its posterior parietes, are softened. That the softening of the mucous membrane always occurs only at those places where the liquid food has been in contact with them for some time, may be easily demonstrated in animals killed immediately after being fed with some fermenting substance, and the cadavers placed in different postures, upon the back, upon the belly, upon the right side, or hung up. *Elsässer* has also applied this test to the infantile cadaver, having placed one, immediately after death, upon the right side for twenty-two hours, and he found the fundus intact, but the right side of the stomach, the half toward the pylorus, in a softened state. The mucous membrane at this portion of the stomach was wholly converted into a muco-gelatinous mass, the muscular coat partially so; the contents of the stomach consisted of a liquid gray material, mixed with curdled milk, of the odor of whey, and having an acid reaction. These experiments show conclusively that gastromalacia does not exist at the moment of death, and is only developed when peculiar gastric contents in the cadaver come in contact with the walls of the stomach. They show further that the surfaces of the stomach, in contact with its contents, correspond to the dimensions of the softened portions. In a body, which, until the *post-mortem* examination, has laid undisturbed, the softening of the stomach will never be found to extend beyond the space embraced by the liquid food.

(2.) Direct experiments, particularly those instituted by *Elsässer*, and after him repeated and confirmed by many others, have sufficed to prove that the healthy stomach removed from a cadaver is not only capable of undergoing softening in any acids, but also in any fermentable substances, such as milk and sugar, so long as it maintains the normal temperature of the body.

(3.) Direct experiments on dogs and rabbits have proven that when perfectly-healthy animals, fed on milk or substances containing vegetable acids, are killed during the process of digestion, and allowed to remain for twenty-four hours in a proper temperature, softening in the highest degree and perforation of the stomach take place. In rabbits an almost total disappearance of the stomach is sometimes noticed under these circumstances, nothing remaining of the destroyed organ but loose mucus adherent to the still remaining portions of food. This condition is frequently met with in the *post-*

mortem examination of suicides, of the executed, and, in many instances, of sudden death.

Softening of the stomach, then, may be artificially induced outside of the body, in most animals, by a very simple procedure.

(4.) Children attacked by cholera nostras, who, according to the alleged identity of the symptoms of cholera nostras with those of gastromalacia, suffer also from the latter, recover frequently, and immediately thereafter may die from another disease. No trace, however, of a *cured* gastromalacia has ever yet been found in the infantile cadaver; and yet such a destruction as occurs even in the mildest grade would probably give rise to marked cicatrices or contractions of the affected parts. Nor, as has already been stated, have any traces of reaction or demarcation ever been found in a softened stomach, such as otherwise occur in all vital processes.

(5.) The symptoms which should characterize softening of the stomach during life are variously given by authors. Most of them, in fact, describe the symptoms of cholera nostras, others observe cerebral compression or cerebral irritation, and still others only the usual atrophy, out of which the chronic softening of the stomach is then construed. Moreover, the symptoms of cholera nostras do not harmonize with the pathological changes of gastromalacia. It is very improbable that a stomach affected with softening would be constantly disposed to such active contractions as is necessary to produce the act of vomiting. And if the children were affected with softening of the stomach during life, and should vomit, then pure *blood* ought certainly to be thrown up, for the arteries of the softened parts are *not* obliterated, as is known to all anatomists acquainted with minute injections.

(6.) The nervous system has been called upon for assistance in various ways by the vitalists, as those physicians are termed who regard the softening of the stomach as a process which occurred during life, to explain their theory. The doctrine of semi-paralysis of the vagus nerve seemed adapted to explain all the symptoms, particularly the absence of pain and reaction, sustained as it was by the frequent occurrence of softening of the stomach in cerebral and pulmonary affections. *Elsässer*, on the contrary, very appropriately observes that pathological changes within the cranium, like softening of the stomach, occur frequently in children, and their coincidence will continue to be suspected as accidental, until extensive statistical tables shall have shown how often cerebral affections occur in children independently of gastromalacia, how often gastromalacia has been found by itself, and how often both together. According to the statistics hitherto collected, *Elsässer* denies the existence of a relation between cerebral affections and softening of the stomach. The experiments instituted by *Camerer*, to prove the influence of vagus paralysis, have no merit whatever. For example, he found that the stomachs of healthy rabbits, in which the contents of the softened stomachs of infants were introduced, suffered no bad effects whatever therefrom; but in rabbits, in which the pneumogastric and sympathetic nerves of both sides had been divided before the contents of such stomachs were introduced, death ensued in about sixteen hours, and that in one case, six and a half hours after death, all the coats of the stomach were found markedly softened; in another, seventeen hours after death, the greater part of the fundus of the stomach was dissolved. Unfortunately, he neglected to perform the counter-experiment with a healthy rabbit, viz., to divide the pneumogastric and sympathetic nerves without introducing the contents of softened stomachs, and then observe whether softening had taken place. Even perfectly-healthy rabbits exhibit softening of the stomach under this experiment, providing the animal be killed soon after the contents of a softened stomach of a child, or any other acidulous nutriment, has been administered to them, otherwise the injurious contents will be propelled onward into the alimentary canal by the action of the digesting stomach, and thus be divided too much to answer that purpose. That the stomachs of rabbits thus operated on underwent the process of softening, although they retained vitality for sixteen hours after the acidulous gastric contents had been introduced into them, is readily explained by the paralysis of the muscular coat of the stomach which it produces. As a result, the contents of the stomach remained unmoved till death ensued. But to assume at the same time a paralyzed state of the nerves of the stomach, and a "super-acid" gastric secretion, as is also maintained by some authors, is physiologically incorrect, because *Tiedemann*, and many physiologists after him, have demonstrated the fact that, after the division of the pneumogastric nerves, the gastric juice is found to be neutral, or, at least, less acid than in the normal condition.

Thus, then, according to my judgment, sufficiently weighty reasons have been given—each one of which is enough—to prove softening of the stomach not a disease; and it is only to be wished that many other time-honored and unquestioned pathological conditions could also be as accurately and positively proven to be what they really are.

(6.) CATARRHAL INFLAMMATION OF THE INTESTINES (*Catarrhus Intestinalis*).—As the stools of *intestinal catarrh* have already been described in the section on "Diarrhœa," it remains only for us to speak of the pathological anatomy of the disease—etiology, symptoms, termination, and treatment.

If a child acquires an acute intestinal catarrh during the last few days of life, and succumbs to it, the mucous membrane of the small and large intestines will be found generally turgid, in some places either dentritically injected or traversed by a diffused, livid redness, the injected places generally corresponding to the angular curves of the gut. The solitary glands, especially in the large intestines, are seen to be distinctly swollen, and to project like small whitish prominences—of the size of pins' heads—above the reddened mucous membrane. They contain the same cells that are found in them in the normal state, but in much greater numbers. If the intestinal catarrh has existed but a short time, these lenticular follicles and Peyer's glands, which, in fact, are only to be regarded as lenticular follicles occurring in clusters, will never, or very rarely, be found ruptured; whereas in chronic intestinal catarrh they are usually seen to be ruptured, and here and there dyed with black pigmentary matter. Over large tracts of mucous membrane the newly-formed epithelial cells having been cast off prematurely and rapidly (the essential phenomenon of intestinal catarrh), do not again assume the character of primitive cylindrical epithelium, but retain the circular form of mucus corpuscles. The whole mucous membrane, as a result of the augmented afflux of blood and serous exudation, becomes swollen and heavier. The submucous cellular tissue, in the simple catarrh, remains intact; in the chronic it increases in thickness, as does also the muscular coat. The black pigmentation of the solitary intestinal glands, which gives to the entire mucous membrane a grayish-black color, almost invariably seen in chronic intestinal catarrh of adults, never occurs in nurslings, nor in larger children, except faintly, although chronic diarrhœas are usually extraordinarily protracted in the infant. The mesenteric glands are sometimes reddened, but *never infiltrated and hypertrophied*, as in enteritis folliculosa.

Etiology.—The primary idiopathic intestinal catarrh occurs in nurslings much less frequently than in artificially-reared children. In the former it is scarcely ever caused by the nutriment, mother's milk; but, if the wet-nurse is unwell, suffers from diarrhœa, or is afflicted with some mental trouble, restlessness, colic-pains, perhaps a very mild and transitory diarrhœa will attack the nursling, more or less markedly interfering with its development. Most frequently intestinal catarrh in nurslings originates from cold, or eruption of the incisors, as a result of swallowing large quantities of secreted saliva and mucus, and at the time of weaning (diarrhœa ablactatorum). In children brought up by hand, the nutriment is a prolific source of the most varying diseases, particularly of diarrhœa. It has already been observed in the section on "Nutrition," that the casein of cow's milk curdles in the infantile stomach into large lumps, whereas that of woman's milk forms only loose flakes, by which alone the great difference between the freshest and best cow's milk and the milk of a wet-nurse may be explained. But in large cities, where the artificial rearing of children is of the greatest frequency, it is actually impossible to procure fresh milk several times a day, and it is needless to mention the manifold adulterations of the milk. There is scarcely an artificially-brought-up child who has not suffered at least once, for a long time, from intestinal catarrh, and was thereby retarded in its development for several months.

In children over one year of age, the process of dentition is the most frequent cause. Even the physiological process, as is known, is accompanied by a moderate diarrhœa, which, however, may be aggravated and become the most profuse, cholera-like diarrhœa, and prove fatal in the course of twenty-four hours, or bring on an irremediable marasmus.

On the other hand, diarrhœas, in consequence of abnormal irritation of the food, are less frequent in children who have passed the first year of life, for the stomach is then more capable of digesting heavier articles of diet. In summer, before the various kinds of fruit have attained a proper degree of ripeness, intestinal catarrh occurs among children of this age, epidemically, and is usually liable to assume more of the character of dysentery, for, in addition to the numerous evacuations, the children also suffer from colic-pains, obstinate tenesmus, and sometimes also from bloody stools.

Symptoms.—In small children affected with diarrhœa, various changes may be observed even before the appearance of the principal symptoms of this complaint. They become restless, cry almost unceasingly, draw up the thighs, refuse the breast or sucking-bottle, in short, have the various symptoms of flatulence and colic. With the first watery or liquid stool, if it is at all copious, almost all the symptoms of colic disappear permanently, if the exciting cause of the diarrhœa was only a temporary one, for example, a small quantity of sourish milk. This rapid subsidence, however, is seldom the case, it occurring almost only in children at the breast. Usually a single administration of sourish milk suffices to induce a severe intestinal catarrh that will last for weeks. The greater the extent of the surfaces of the intestines affected with catarrh, the more profuse will the diarrhœa be, the longer it will last, and the more severely will the nutrition suffer from it. Catarrh of the small intestines causes scarcely any colic and but little diarrhœa, for the secretions that are then poured out may in greater part be absorbed by the large intestines. Catarrh of the large intestines, on the contrary, and particularly of the rectum, is frequently combined with violent pains, with tenesmus, and with constant profuse diarrhœa. The color of the fæces in diarrhœa is normal at first, but with every evacuation it loses in tint, so that finally a very bright yellow, even gray, rice-water-like fluid, without any smell, is discharged. The return of darker color and of odor to the fæces may be looked upon as the most favorable sign of the speedy cessation of the diarrhœa. The abdomen is usually painful about the navel; it is somewhat distended; borborygmus is present; the percussion-sound, when much fluid happens to be in the intestines, is in one place dull, and in another tympanitic. The secretion of urine is very much diminished; it is very rich, comparatively, in pigmentary matter, and, if allowed to stand for several hours at a low temperature (under 54° F. at the least), will deposit a sediment of double urate of soda, the so-called brick-dust precipitate. The thirst is very great; the peculiar circumstance is sometimes observed here, that the child refuses to take the breast during a severe attack of diarrhœa, but readily drinks sweetened water, or prefers pure cold water; as soon, however, as the diarrhœa is checked, it will not touch any cold water, and returns to the breast with its former avidity. Artificially-fed children will take a few teaspoonfuls of broth to allay thirst, by which they are quieted for a short time, but very soon become all the more excited by the irritation caused by the newly-administered food; from this excitement they do not recover for hours. When a child is so unfortunate as to be attended by persons who suppose that its restlessness can be allayed by feeding it, and will therefore rise several times in the night to prepare pap or porridge for it, though it may consume but a very few teaspoonfuls, we will never succeed in saving it from death, unless they can be convinced of their false views and pernicious practice. I, at least, have never yet been able to carry a child through, that was nursed by such attendants.

At the invasion of a simple intestinal catarrh, the children have no febrile symptoms, such as dryness or increased temperature of the skin; on the contrary, when the diarrhœa is profuse and colorless, they soon become cold, the tip of the nose white and cold, the breath loses its natural warmth, the lips turn pale and bluish, as do the tips of the fingers, and the adipose tissue that fills up the orbits disappears extremely quickly, the eyeballs sink back into the orbits, and the expression of the countenance peculiar to these patients results. But after the diarrhœa has been arrested, fever usually comes on in consequence of the augmented metamorphosis of the tissues, in most cases lasting very long, retarding the recovery, and often leading to enteritis folliculosa and atrophy. When this fever of reaction is of short duration, a rapid recovery will ensue after its disappearance. The stools for some time will retain their abnormal quality, for they either become very hard or remain slimy, and then assume an offensive smell, the appetite returns again, and the children remain quiet after their meals; this is the surest sign that the digestion again goes on without difficulty.

The most frequent complication of this disease is catarrh of the stomach; the vomiting, however, as a rule, ceases before the diarrhœa. Bronchitis complicates intestinal catarrh equally often. The prognosis assumes a most unfavorable aspect when the disease passes into enteritis folliculosa, which happens so frequently in artificially-reared children.

Treatment.—In children at the breast, a mere dietetic treatment of the wet-nurse is usually sufficient. If she suffers from dyspepsia, without fever and intestinal catarrh, as is very frequently the case from emotional excitements, then her diet should be restricted for a few days; she should only be allowed milk, soups, some coffee, meat-broths, and boiled fruits; as a drink, almond-milk, wine-and-water, or pure water. The secretion of milk from such a diet, so long as there is no continued fever present, is never arrested; it is at the most somewhat diminished, but that is very beneficial to the nursling that suffers from diarrhœa.

If a wet-nurse, through some error of diet, has contracted vomiting and diarrhœa, a stricter regimen will have to be instituted; she should then get nothing but mucilaginous soups, wheat bread, and demulcent drinks, rice-water, gum-water, salep-water, or almond-milk; and if, after two or three days of such a course of treatment, the diarrhœa is not arrested, then ten or twelve drops of laudanum are to be given to her immediately after nursing the child, and she should wait at least four hours before she puts the child to her breast. But if the diarrhœa nevertheless tends to run into a chronic form, and no benefit has accrued from the use of laudanum, then, while enforcing a strict diet, I desist from the further use of opium and give astringents, alum, tannin, colombo, argent. nitr., etc. Medicine can seldom, if ever, accomplish much in children at the breast, because most of them unwillingly take any thing from a spoon, and spit the fluid out again that has been poured into the mouth. For these reasons, the pencilling of the mouth with laudanum is the most convenient and practical procedure. For this purpose, I use a camel's-hair brush, dip it into tr. opii. c., shake off the first drop by snapping it with the finger and then introducing it into the mouth of the child, press the chin a little upward, and pull the brush out from between the compressed lips. In this manner about half a drop is left in the mouth, and, if two or three drops of water are dripped upon the tongue, the child will swallow all the fluid contents of its mouth without any delay. Usually a sleep of several hours' duration and an arrest of the diarrhœa follow upon this procedure. I have never observed from this application the bad effects, cerebral irritation, and cerebral congestion, which are said to ensue from opium, possibly from larger doses or from a long-continued use.

Great benefit is derived, in children at the breast suffering from this disease, from small clysters of demulcent decoctions, barley infusion, for example, with one or two drops of laudanum. For the introduction of medicines into the rectum, which in order to become absorbed ought to remain there for several hours, the common children's syringes are much too large, and I have therefore for some time been in the habit of using small uterine or urethral tin syringes, which I apply myself after having them well oiled and warmed. Quantities of two or three drachms are almost always retained, and the action of the opium begins in from thirty to sixty minutes.

Children brought up by hand suffer from a totally different kind of intestinal catarrh than those at the breast, for the exciting cause of the disease, the unsuitable nutriment, is not here a temporary one, but is continued for a long time and during the sickness. In general, the rule holds good that *no child with intestinal catarrh tolerates cow's milk*, whether pure or mixed with tea or boiled into a broth with meal or bread, and that the diarrhœa will only exceptionally be arrested if a milk-diet is persevered in. The first condition, therefore, is a total abstinence from cow's milk. As soon as liquid stools appear, the patients should only be allowed demulcent drinks, of which the best and most constipating is a decoction of salep, prepared fresh twice a day, by boiling as much powdered salep as can be taken up on a silver half-dime in ten ounces of water. In place of milk, the children may be allowed for their meals a thin mucilaginous beef-broth, with rice, barley, or groats, slightly sweetened with sugar; it should, however, be deprived of fat, and without salt. This diet is to be continued for twenty-four hours after the stools have acquired their normal consistence; if the appetite has improved, a few teaspoonfuls of triturated wheat-bread may be boiled in the beef-broth. For further particulars, we refer the reader to the chapter on "Artificial Nutrition," p. 43. After the stools have been normal for at least two days, a trial may be made with one milk-pap each day, then with two, and finally three a day, and the salep-water should be continued till it may appear proper to substitute it by the ordinary spring-water.

The pencilling of the mouth with laudanum and the use of opiate clysters stand at the head of all therapeutic measures. But occasionally, in the profuse diarrhœa of summer, opium proves inefficacious; then small doses of calomel, gr. ⅛ three or four times daily, or a solution of nitrate of silver (gr. ss to water ℥ iij), with the addition of one drop of laudanum, without any syrup, proves more effectual. Vegetable remedies containing tannic acid, such as colombo, rhatany, pure tannic acid itself, and astringents in general, are with difficulty administered to small children, unless mixed with large quantities of syrup, and on that account are but seldom resorted to; in older children, however, they may be oftener employed. In some instances I have seen the diarrhœa checked by a solution of alum (gr. vi to mucilage ℥ iij), though it was not possible to arrest it by any of the remedies just mentioned. The principal treatment will always be a proper prophylaxis. No cow's milk should ever be given to children, unless it is first rendered alkaline by adding a teaspoonful of a soda solution (ʒ j to water ℥ vj) to every meal, as described in a previous chapter, and it will then become speedily evident that intestinal catarrhs may often be avoided, or, where they already exist, rendered less severe and protracted. Had I the choice, when compelled to treat an intestinal catarrh by the diet or by medicine only, I would prefer to try the dietetic treatment alone; for I have often satisfactorily convinced myself of the utter inefficacy of all therapeutic remedies in the treatment of this disease when the child is sustained on a milk diet.

(7.) ENTERITIS FOLLICULOSA AND TABES MESENTERICA.—It is of great practical importance to carefully diagnose between simple intestinal catarrh and enteritis folliculosa, although the anatomo-pathological differences are not very striking, and the transitions of that disease into the one under consideration are of very frequent occurrence.

Pathological Anatomy.—The submucous tissue is found markedly infiltrated, so that the bowel has perceptibly increased in weight, and the signs of an acute intestinal catarrh are present upon the entire mucous membrane of the large, and upon an extensive tract of the small intestines, i. e., instead of the normal cylindrical epithelium, none but mucous corpuscles are seen. The solitary glands and Peyer's patches are in some parts intensely swollen, and at the first glance are seen to project like white nodules above the level of the mucous membrane; in other parts, however, they are already ruptured, and then represent empty, minute, crater-like excavations. These excavations occur upon the summits of the elevations originally produced by the swelling of the follicles. The mesentery is injected and turgid, the chylopoëtic vessels are plethoric, and of a pink color; the mesenteric glands in those regions corresponding to the intestinal catarrh are increased in size from two to four fold; in recent cases, when cut into, the incised surface presents a rose-color, but, when of longer duration, a yellowish-white color. The microscopic elements are the same as in the normal mesenteric glands, but when the color is yellowish and the gland has increased in hardness, the connective tissue will be found to predominate. Here, too, as in simple intestinal catarrh, notwithstanding the long existence of the diarrhœa, remarkably little pigmentation of the mucous membrane is found. The essential anatomo-pathological difference between intestinal catarrh and enteritis folliculosa consists in the circumstance that in the latter the mesenteric glands participate in the disease. It is much to be regretted that neither by injections nor in any other manner can it be experimentally proven that the absorption of the chyle is hindered by these hypertrophied mesenteric glands, and thereby the nutrition and progressive development of the child interfered with. But, when in an atrophied child, whose condition was originally induced by enteritis folliculosa, no changes but those indurated and hypertrophied mesenteric glands are found, the supposition becomes very probable, that the passage of the chyle has been mechanically interrupted, and thus the children, although they have consumed an enormous quantity of food, and have had no diarrhœa for weeks preceding death, have nevertheless languished to a certain extent for want of a sufficient supply of chyle. The term tabes mesenterica of the older physicians is therefore by no means so incorrectly founded and obsolete as some of the later writers are inclined to represent it. The older erred only in this, that they thought they *could feel the enlarged glands.* In this glandular hypertrophy the intestines always become tympanitic and distended, and then it is altogether impossible to feel these small tumors, which scarcely ever attain to the size of a hazel-nut, between or beneath the tense bowels. At any rate, they must be forcibly compressed against the vertebral column, if it is desired to feel them.

In instances of *developed tuberculosis of the mesenteric glands*, as it sometimes occurs in children several years old, the firm, hard, solitary tubercles may indeed be felt through the abdominal walls. But these are larger glands agglomerated into patches or masses, and traversed by deposits of cheesy tubercle. Such slight enlargement as is observed in enteritis folliculosa can never be detected during life by the sense of touch.

Symptoms.—Enteritis folliculosa always begins with intestinal catarrh, and consequently we may refer the student to the symptoms of that disease given in the preceding section. But, instead of the stools becoming semisolid in a few days, and the nutrition regulated as in simple intestinal catarrh, they remain perfectly liquid and assume a putrid, foul odor, erode the anus and its adjacent parts, the inner surfaces of the thighs, and even the heels, which are brought in contact with the anus by contractions of the thighs and legs. An intense continuous fever becomes superadded, and the patients have a constant and severe thirst. The tongue is red and smooth, or coated with a white fur, and in the latter stages of the disease almost always affected with thrush. Vomiting is frequent, but not present in all cases. Rapid emaciation is characteristic of the disease. In previously perfectly-healthy, well-nourished children, small wrinkles are soon observable on the inner surfaces of the thighs; and the adipose tissue, that was previously firm and solid, is now felt to be soft and flabby. Under the continuation of this putrid diarrhoeal discharge emaciation progresses so rapidly that, at the end of a few days, the bones of the hands and feet plainly show their outlines, and the integument on the thighs forms loose, flabby folds. On both sides, a collection of inguinal glands may now be detected, which also swell up to twice or thrice their normal size. The eyes are sunken, a deep fold forms from the inner angles to the zygomatic arches, the cheeks become pale and flabby, the contours of the masseters distinguishable, the chin pointed, the neck wrinkled, the sterno-cleido-mastoidei muscles and larynx prominent, the ribs can be counted without being touched, and the vertebral column and bones of the pelvis are covered by an atrophic skin only.

A very peculiar phenomenon may be observed on the occiput. The superior border of the occipital bone shoves itself beneath the parietal bones, thus forming a step, the upper plane of which is formed by the parietal bones, and the lower by the occipital bone. Exceptionally the occipital glides over the parietal bones. A similar but less striking displacement takes place at the frontal bones, the superior borders of which slide beneath the parietal. The diminution of the cavity of the skull is caused by a decrease in the size of the brain, for this organ participates in the general atrophy, and, since it consists in greater part of fat, it must, therefore, also suffer a decided loss of this material. So far as I am aware, there is no quantitative chemical analysis of the brains of *atrophic* children to be found, it is only known that the brains of young children in general are poorer in fat than those of the adult; such an investigation is really a desirable one, and for which the Pædiatria should call upon pathological chemistry. If the bones of the cranium have once overridden each other, and cerebral atrophy has become superadded, an improvement is only to be looked for in the rarest instances; the patients almost always waste away more and more, and invariably perish, although they may have had no diarrhœa for weeks, the stools, however, retain a putrid odor, and the appetite remains to the last. From this atrophy of the brain (to be hereafter considered under the heading of Hydrocephaloid Disease) a long train of cerebral symptoms results. We find in the abdominal integument one of the best indices as to the degree to which the atrophy has reached. If, pinched and raised into a fold, it remains for some time after the fingers are removed, the prognosis is always, and under all circumstances, to be regarded as most unfavorable; the prospect of recovery always improves in proportion to the rapidity with which a fold of the integument thus produced disappears.

In atrophic children with tympanitic abdomen—a condition which, in fact, is usually present in atrophy, as a result of enteritis folliculosa—small solitary tubercles of the size of pins' heads are seen upon the abdominal integument, united to each other by very fine cords, and only recognizable by the feel. These cords are not plugged-up veins, because veins, when the integument is so atrophied, and in such a superficial position, would appear bluish or black. They can only be obliterated veins, or, what is still more probable, lymphatic vessels—a supposition which may serve to explain the character of the small nodules.

Treatment.—Every thing that has been mentioned in connection with catarrhus intestinalis is applicable to the treatment of this disease, as an effect of which, the infiltration of the mesenteric glands may be regarded. As a rule, all methods of treatment are inefficacious. There is one remedy, however, from which I have seen some very striking, favorable effects, namely, mother's milk. Atrophied children, after four or even six months' disease, already at the brink of the grave, suffering from putrid diarrhœa, a thrush-covered tongue, and in incessant restlessness from pain, or tearing their faces with their long, lean fingers, when put to the breast of a mother, are changed as if by magic. At first they suck only for a few seconds, and then relapse again into their habitual restlessness, but, after a few days, nurse like healthy children, and sleep for several hours at a time; the evacuations become yellow, their odor normally sour; and they regain flesh and strength so rapidly that they can scarcely be recognized after a few weeks. Where the circumstances are such as to preclude the possibility of procuring a wet-nurse, the prognosis, as already said, is fere lethalis. In such cases I have several times succeeded in reducing the temperature of the skin by the use of cinchona, gr. j, twice daily. The atrophy also diminished, and, under an extremely cautious, laborious feeding, the children finally began to thrive. As an after-treatment, ℞. mart. pomat., ten drops three times daily, is to be given for a long time. This treatment, however, generally fails, the temperature of the skin is diminished for only a short time, the patients sink little by little, till finally, often after many weeks of suffering, they are relieved by death.

(8.) DYSENTERY—THE FLUX.—In great epidemics of dysentery—such as are especially malignant in swampy regions and in the tropics—children under one year of age are almost totally exempt. A few instances are recorded, however, of women who, while suffering from flux, gave birth to children that immediately after birth perished of dysentery. Older children, particularly after the second dentition, are as liable to it as adults.

Sporadic dysentery, on the other hand, frequently occurs in infants, but, on account of its mild, almost harmless course, is not usually particularly watched.

Symptoms.—The symptoms of sporadic and epidemic dysentery may very properly be treated of together, it being only necessary to observe here that the sporadic form never exhibits the intense and dangerous character of the epidemic disease.

The best index of the condition of the intestinal mucous membrane is always obtained from a careful inspection and dissolution *of the stools.* Every stool which contains a glairy mucus, formed into lumps, indicates a morbid alteration of the mucous membrane of the large intestines, or, at least, of their follicular apparatus. With this glairy mucus, resembling granules of boiled starch, a few streaks of blood soon become associated, or the whole stool becomes uniformly bloody, according as the bleeding occurs near to or far from the anus. As this mucus increases, the proper fecal masses constantly grow less and less, and finallylumps of mucus, with only an admixture of fæces, are evacuated. There is, generally, no great difficulty in recognizing the blood that has become mixed with the alvine discharges; if streaks and small lumps of blood are present, it will be apparent at a glance, and, even when the blood has been for a long time in contact with the mucus, a part of the blood and mucus will become thoroughly mixed with each other, and then they will give to the whole evacuation a pink or an actually red color. In fact, this discoloration alone suffices to convince us of the presence of blood, because no other substance giving this color occurs in the fæces. For beginners, and in the interest of clinical instruction, I will add that, if doubt of its bloody origin occur, it may be easily decided by the microscope.

If ulcers form, which scarcely ever happens in sporadic flux, the evacuations assume a dirty-gray or grayish-red color, and a putrid odor, on account of sloughed mucous membrane, and large quantities of pus discharged from the ulcers becoming mixed with them. The exfoliation of large patches of mucous membrane, said to have been frequently observed in tropical dysenteries, I have never observed in this country. Occasionally firmer lumps of loamy fæces, wrapped up in purulent or bloody mucus, pass off, although the rest of the symptoms do not by any means indicate that the disease is about to be checked. These clayey lumps are, most probably, derived from some part of the small intestines not affected with dysentery. This condition does not by any means improve the prognosis. For immediately after the discharge of these fæces, which deceptively indicate an amelioration of the disease, the previous state of the alvine evacuations reappears.

A red and a white flux, according as to whether blood is or is not mixed with the stools, has been spoken of—a classification which naturally dispenses with all scientific basis, for it is very possible, indeed, for a child to have the white flux on the first day, the red on the second, and the white on the third or fourth again. When improvement actually takes place, the discharges will first assume a fecal odor, subsequently the normal consistency, and the muco-purulent character gradually disappears. Round worms, when present, are invariably expelled with the dysenteric fæces. At the invasion of the disease the stools have a fecal odor, and this odor returns when the child progresses toward recovery; at the climax of the complaint the normal odor has wholly disappeared, or it is sourish and unhealthy. In the epidemic flux, when pus and pieces of sloughed mucous membrane are ejected, the stools become intensely pungent and putrid, resembling sulphuretted hydrogen. Microscopical examination reveals mucous-corpuscles, epithelium-cells, blood-corpuscles, large aggregations of oil-globules, some particles of food, villi, and triple phosphates—all embedded in a molecular, finely-granular mass, whose chemical reaction is usually alkaline. Albumen may be demonstrated to be present by diluting and agitating the stools with distilled water, and then filtering the liquid, and subjecting it to the appropriate tests. The stools vary in number exceedingly. In the milder forms, four to eight; in the severer, twenty to thirty passages take place in the twenty-four hours, the number depending less upon the quantity to be evacuated, for that is often very slight, than upon the degree of tenesmus.

Abdominal pains and tenesmus *are never absent;* the pain is mostly paroxysmal, but, at the climax of epidemic dysentery, children moan unceasingly. Touching any part of the abdomen, near the navel, or over the course of the colon, produces pain. The tenesmus is very tormenting; the lower folds of the rectum are frequently seen to protrude, presenting a livid-red color, and, notwithstanding the violent efforts at expulsion, scarcely a teaspoonful of mucus can be discharged. Prolapsus of the rectum is a frequent result of this straining. The use of clysters, which in dysentery has the most beneficial effect, is by this tenesmus rendered very difficult and often impossible. Nervous children are often attacked by convulsions in consequence of the aggravated pains caused by the introduction of the injection-pipe. Tenesmus usually comes on with the first mucous evacuation, and remains throughout the disease. If the disease continues to grow worse, paralysis of the rectum may ensue, relieving the tenesmus, but rendering the prognosis extremely unfavorable.

In epidemic flux, vomiting sometimes occurs, and, if persistent, is a sign of commencing peritonitis. In sporadic dysentery it is only very exceptionally observed.

No fever is usually present at first; it appears in the course of the morbid alterations of the intestines. The pulse supplies no index whatever to the severity and extent of the lesions. The temperature of the skin is seldom increased; it is usually normal, in grave cases even diminished. Delirium and convulsions come on tolerably often in nervous children, even in sporadic dysentery.

The secondary morbid conditions of sporadic flux that should be mentioned are lobular pneumonia and tabes mesenterica, with infiltration of the mesenteric glands. In connection with epidemic dysentery, anæmia, pyæmia, marasmus, intestinal perforations, peritonitis, strictures of the intestines, icterus, and hepatic abscesses, deserve consideration. In the sporadic form recovery may take place in from four to six days, in the epidemic in ten to fourteen. The emaciation attendant upon this disease is very great; many children succumb to the sequelæ who have escaped the disease. Death may take place either during the first few days of the disease or in the chronic stage.

Epidemic dysentery is known to become complicated with all possible acute and chronic affections. The sporadic principally attacks children in the first dentition, and older ones in the hot summer months, at the season of unripe fruits.

Pathological Anatomy.—The dysenteric exudation is only found in the large intestines and rectum, more particularly upon the summit of the folds, at the flexures of the bowel, and is seen as a dirty-white, yellowish-gray, grayish-red, or dark-colored layer, which often attains to the thickness of a line, and may be easily stripped off. The mucous membrane beneath it is reddened, softened, and swollen; the internal surfaces of the bowel present an uneven appearance. Within the intestines, the dysenteric mucus and the feculent masses are found. After several days this mucous membrane is cast off in fragments, and superficial or deep ulcers, with prolonged points and indentations, now make their appearance. The solitary follicles are always swollen, if not ulcerated. In the rest of the organs the signs of anæmia are found, but the peritonæum, especially the parts corresponding to the morbid lesions in the mucous membrane, is injected. In sporadic flux, extensive or deep ulcers are very rare.

Treatment.—Uniform warmth in a well-ventilated room and spare diet are indispensable measures in the treatment. Cold drinks aggravate the pains, and therefore every thing administered should be lukewarm. It is best to give the children nothing but mucilaginous broths and demulcent drinks; those at the breast bear very well the wet-nurse's milk; in artificially-reared children cow's milk produces violent pain, and for this reason should not be administered. Opium is the sovereign remedy in dysentery, and the safest method of applying it is in the form of clysters, but in this, unfortunately, we are often interfered with by the tenesmus. In such cases the pencilling of the mouth with laudanum, spoken of in the treatment of intestinal catarrh, will then have to be resorted to. I, however, never yield to the assurance on the part of the attendant that it was not possible to inject the medicine, but always try myself to administer the clyster, which I usually make of a drachm or two of some mucilaginous substance, with one drop of laudanum, and I often succeed in it, although the existing circumstances were not encouraging. Very good effects are also derived from the combination of calomel and opium. For example, to a child one year old, I give the following:

℞. Calomel gr. $\frac{1}{8}$,
Op. pur. gr. $\frac{1}{24}$,
Sach. alb. gr. v,
Dent. tal. dos. n. viii,
S. one powder every two hours.

Vegetable astringents, nitrate of silver, and alum, are useful only after the pains have been mitigated, and in the chronic stage.

(9.) INTUSSUSCEPTIONS.—By intussusception, or invagination of the intestines (also called volvulus), we understand a slipping of one piece of the bowel into another, after the manner that the finger of a glove is reflected upon itself and shortened in pulling off a tightly-fitting glove.

Pathological Anatomy.—Not all invaginations, by any means, which are found in the infantile cadavers, were diseased conditions during life; most of them indeed, having occurred in the agonies of death, show no trace of inflammatory reaction, may be disengaged with the greatest ease, and may be seen in many places at the same time; but these occur only in the small intestines. Singularly enough, they are found only in perfectly healthy intestines, not in the autopsies of cholera, flux, typhus fever, or peritonitis, although they are seen also in children who have succumbed to cerebral diseases, and seem to be the effects of an unequal innervation of the muscular coat of the intestines, which manifests itself preëminently in articulo mortis. However, there is also a long list of instances where, even in children under one year of age, invagination, with all its results—intestinal stenosis, intestinal hæmorrhage, stercoraceous vomiting, rapid collapse, etc.—occurred, and as a rule terminated in death. The pathological displacement of the piece of the bowel is the same in both kinds of invagination.

Every invagination consists of three continuous portions, lying upon each other, of which the outer and middle have their mucous surfaces, the middle and inner their peritoneal surfaces, in contact, as may be readily seen from the accurate drawing, Pl. III., Fig. 3 B. The external layer, or wall, *c c*, ***Rokitansky*** calls the sheath, or the intussuscipiens; the innermost one, *a a*, the advancing; the middle, *b b*, the protruding tube, and both together the intussusceptum. Between the advancing and protruding tube the flexed, conically-folded transverse section of the intussusception is found, which exercises a particular influence upon the shape of the invagination. The dragging of the mesentery serves to explain the reason why the invaginated intestinal piece never runs perfectly parallel into its sheath, but always presents a curve, and of its orifice not lying in the axis or centre of the sheath, but always eccentric, because it follows the course of the mesentery inflected along with it, and for this reason also the orifice of the intussusceptum (*d*) is never round, but distorted into a slit.

The enlargement of the invagination is brought about by the mouth of the volvulus (*d*) forming the fixed point, while the sheath at *c c* invaginates itself more and more.

The cause of a volvulus is difficult to explain; the intruding intestinal piece is probably more strongly contracted and has a more active peristaltic action than the wider, overlapping piece of the bowel. This circumstance seems to be sustained by the fact that the process is almost always preceded by protracted diarrhœa, by which the overlapping portion is probably catarrhally weakened, while the intruding portion has a normal mucous membrane and acts normally.

As infallible effects of invagination, we have disturbances of the circulation in the invaginated mesentery, œdema, and hyperæmia of the invaginated gut, and inflammation and plastic exudation upon the peritoneal covering of the prolapsed and overlapping tube (*a* and *b b*). The œdema and inflammation of the invaginated portion may attain to such a degree, that the calibre of the intruding tube, at first still pervious, becomes completely occluded, and then no alvine matter, but bloody mucus only, will pass off per anum, and stercoraceous vomiting will take place.

Generally the invagination takes place from above downward; it frequently occurs in the large intestines, and when in the rectum may possibly be felt per anum.

Intussusception proves fatal either from the peritonitis spreading over the entire intestines, or from gangrene of the invaginated piece.

Symptoms.—While the calibre of the gut is still incompletely closed, the symptoms will not be particularly characteristic, but when total stenosis has once taken place, then the well-known signs, as in strangulated hernia, supervene. The invagination of the gut by itself, even without total constriction, always gives rise to the most violent colic-pains, conjoined with which the abdomen soon becomes tympanitic. In some instances, an oblong tumor may be felt, which is regarded by many authors as the invaginated portion of the bowel, but it much more probably consists of alvine masses, which have become arrested at the volvulus. The patients are generally constipated, although diarrhœa may also occur, and in many cases large or small quantities of *blood* may pass with the stools. The latter may be looked upon as the most constant and pathognomonic sign of the complete form of the condition. The vomiting of every thing partaken of is almost equally constant, attended, sooner or later, by a yellow or greenish gastric mucus. The patients sink quickly into a state of collapse, with an expression very much like that of cholera patients, and death, as a rule, takes place on the third or fourth day.

A favorable but very rare termination is in general adhesions of the invaginated portions of the bowel, and subsequent sloughing off of the gangrenous piece. Some authors assert that the symptoms occasionally abate, even without gangrene and sloughing of the constricted portion, that the calibre of the gut increases, and the invagination may thus remain fixed. In that case, however, the canal is ever afterward constricted, presenting a more or less permanent obstacle to the passage of its contents. A chronic, relapsing state of inflammatory swelling is the result of this condition, which may readily develop itself into enteritis and cause new intussusceptions.

Treatment.—The theoretic suggestions of *Rokitansky* to try injections by air or aspirations by means of a suction-pump, before the volvulus has become firmly fixed by exudation, will always remain theoretic. All remedies which cause an increased peristaltic action may do as much harm as good, for although the volvulus may, it is true, possibly become disengaged, yet in the reverse motions it may also become much aggravated, and a commencing and fortunate agglutination may thus be torn apart and interrupted. For the same reason neither mild nor drastic cathartics should be given, and still less emetics. The renowned application of mercurius vivus is at least harmless and often proves useful; for the diminishing, constricted calibre of the œdematous invaginated gut may be thereby mechanically rendered a little pervious.

The most rational treatment seems to me that suggested by *Pfeufer*, and often already successfully carried out. It consists in *absolute rest*, *strict diet*, and in the *production of narcotism by opium* so as to effect a complete arrest of the peristaltic action, while agglutination takes place all around. Gastrotomy has also been successfully performed for the relief of this affection, notwithstanding its very great dangers.

(10.) INGUINAL HERNIA (*Hernia Inguinalis*).—Since umbilical hernia has already been treated of on p. 62 in connection with the diseases of the navel, and since crural herniæ in children hardly ever occur, it only remains for us to speak of inguinal hernia.

Inguinal herniæ in children are, in the great majority of instances, external and generally congenital, though not congenital in the strict sense of the term, but acquired in the first few days of life, by the early action of the abdominal muscular pressure. One or several knuckles of intestine may be forced through the still open *processus vaginalis peritonei* into the scrotum in the male, and the labiæ majoris in the female. The prolapsed viscera lie in contact with the free surface of the testicle, a condition not seen in any acquired hernia.

An oval, not strictly circumscribed, soft, compressible tumor is found in the groin, reaching from the external ring into the scrotum, which, by a uniform, slightly rotatory pressure, may be removed without any difficulty. It is not easy to distinguish the testicle, but on very careful examination it will be found to lie above and behind the tumor. Flatulence, pressure of straining at stool, crying, and coughing, reproduce the replaced rupture. In girls, where the rupture is called " external labial hernia," one or the other labia majoris exhibits a soft, oblong tumor, which, though presenting similar characteristics to the congenital inguinal hernia of the male, never becomes so large, and is less frequently met with. Here the rupture originates by a portion of the intestines, or in very rare instances the ovary, forcing itself into the inguinal canal (*canalis ligamenti rotundi*) destined in the female fœtus for the passage of the round ligament, which is open at its origin, but which before birth usually becomes closed throughout. According to *V. Ammon*, a distinct peritoneal fold rarely forms the covering for the hernial sac in this rupture.

The contents of congenital inguinal hernia almost always consist of one or several knuckles of intestine, very rarely of omentum. At first the rupture is small, of the size of a pea, but soon grows larger and protrudes into the scrotum, inducing shortening and straightening of the canalis vaginalis. Sometimes some serous fluid is effused, and then we have a hydrocele superadded to the inguinal hernia. Violent attempts at reduction, perhaps, also may be a cause of inflammatory and even plastic exudation, in these cases producing filamentous adhesions between the prolapsed intestines and the testicle, when of course it becomes totally impossible to reposit the hernia. Strangulations, however, are extremely rare; yet, when such a rupture temporarily becomes hard, painful, and apparently irreducible, by the aid of a warm bath, or still more easily by the aid of chloroform, reduction may invariably be accomplished.

If the rupture has already acquired a considerable size, and the vaginal canal has become considerably distended, it will protrude again immediately after it has been reduced, and will only remain in the peritoneal cavity so long as the child is in the horizontal posture. These children are extremely liable to become excoriated, and it is as difficult to prevent the integumentary abrasions as to cure them. In the examination of a young child for inguinal hernia, the testicle should first be found, because a testicle that has but just passed through the internal abdominal ring, in a case of retarded *descensus testiculi*, represents a tumor analogous to a commencing hernia. As features distinguishing this condition from hydrocele, we may mention the reducibility of the tumor, in many instances attended with a gurgling noise, the absence of transparency, and the absence of fluctuation. The examination is carried out in this manner: The child is laid upon its back, an effort is carefully made to reduce the tumor, and, when that has been accomplished, the little finger is invaginated in the scrotum. It is next passed on upward toward the ring, the aperture is sought for, and, when found, its position and extent are ascertained with the utmost ease.

If we take a final *résumé* of the most important varieties of congenital inguinal hernia, we find—

In respect to the time of origin:

(1.) *Hernia canalis vaginalis congenita* (rarer form).

(2.) *Hernia canalis vaginalis mox post-partum acquisita* (more frequent form).

In respect to the difference of the sex:

In boys:

(1.) *Hernia canalis vaginalis testiculi congenita.*

In girls:

(2.) *Hernia canalis ligamenti rotundi congenita.*

In respect to the complications:

(1.) *Hernia inguinalis congenita cum hydrocele.*

(2.) *Hernia inguinalis congenita cum adhæsione testiculi ad intestina.*

Treatment.—Most of the inguinal herniæ disappear spontaneously without truss or bandage. This is effected by the best and simplest of all compression of the inguinal canal, viz., by the augmentation of the adipose tissues in the child. Good nutrition, attention to the bowels, and the avoidance of too great and lasting restlessness, suffice, as a rule, to cure this defect. If the precaution is only taken to reduce the hernia while the child is asleep, it will be of little consequence if it is prolapsed for the rest of the day. The reduction is very easily accomplished by the nurse, at the time the child is being put asleep, by pressing her hand firmly, but gently, over the tumor.

I have only seen good effects from the use of trusses in children over one year of age. In very young children it is extremely difficult to apply the truss, and in many instances it is injurious. In the first place it is necessary to have three trusses, in order to have a dry truss every time one gets soiled and wet from the fæces and urine; and, besides, if the child thrives, the old trusses in eight to ten weeks will be found to have become too small and useless, and must be replaced by three new ones, thus, perhaps, requiring a dozen. Furthermore, it is almost impossible to protect the child from becoming excoriated, and the parts that have once become chafed require several days to get well, leaving a new epidermis, which is usually soon destroyed again when the pressure of the truss is reapplied. Lead and zinc ointments, as well as repeated washings with cold water, or with water and brandy, do, indeed, seem to have a favorable influence in rendering the skin less prone to abrasion, but they rarely prevent it altogether. In lean children it is totally impossible to apply the truss, because it can never be properly secured. When, therefore, apprehensive parents absolutely desire a truss to be applied, they should be previously admonished of its great expense, and of the probable bad effects which result from its use. I usually cover the herniæ with a piece of adhesive plaster, or order some harmless ointment to be rubbed in upon them, and insist, in addition, upon the utmost cleanliness, good attention, proper food, and see that the bowels act regularly. By these means I have already seen many children cured. The more rapidly the deposit of adipose tissue takes place in the child, the more surely will the hernia be retracted, and permanent closure of the vaginal canal secured.

(11.) Fissura Ani.—Nurslings and children of all ages suffer sometimes from intense pain about the anus, which comes on at every attempt at defecation, and is due to a small fissure of the anus. Children so affected are always constipated, and the fissure has probably originated from the violent efforts of pressing out the hard fæces. Now and then the firm, dry fæces are stained with blood, and, after defecation, a few drops of blood flow from the fissure, which is so painful to the child that it screams aloud. It is necessary to observe that these rents of the anus cannot be seen by a superficial inspection; so that, in order to discover them, it is necessary to thoroughly separate the nates, and to examine fold after fold of the mucous membrane. They are very small, sometimes not more than from one to three millimetres in length, and differ but little in color from the rest of the reddened mucous membrane of the anus. The pains come on almost always during, and directly after, defecation, but seem to be very severe, if we may judge from distorted features, a general trembling, and reflex movements of the whole body of the child.

Treatment.—It is necessary, first of all, to relieve the constipation, which is best accomplished by the administration of a half to a whole teaspoonful of the watery extract of rhubarb. The method advocated by *Trousseau*, of giving clysters containing ℈j of ext. rhatany, I have not found satisfactory, as the introduction of the clyster itself causes the most intense pain. I cauterize these fissures with lunar-caustic, which is also tolerably painful, but it is only required once, whereas those clysters have to be repeated frequently. I also pay special attention to the bowels, with a view to prevent the fæces from becoming hard. Diarrhœa, also, ought not to be neglected in this affection, for the diarrhœal discharges likewise hinder the healing of the fissures.

(12.) Polypi of the Rectum.—These polypi occur but very rarely, though they are perhaps sometimes overlooked. The recorded cases of this affection in children have occurred in those who have passed the second year of life.

A small and at other times a larger amount of hæmorrhage from the rectum, either with, or immediately after, defecation, is the principal symptom. In girls, who are near the age of puberty, this is readily misinterpreted for commencing menstruation. But the menstrual stains may be easily distinguished from those produced by hæmorrhage from the rectum, by the circumstance that the former are almost always to be found on the anterior part of the linen, while the latter are almost exclusively confined to the posterior part.

The evacuation of the fæces is always painful and difficult, the polypus during that act occasionally protruding through the anal opening, but quickly retracting when the straining ceases. In exploring the rectum by the finger, a painful operation, the polypus is felt to be situated very near the anus. This malady has, in the majority of cases, a tendency to spontaneous cure, resulting from the polypus becoming more and more pediculated, and finally torn off during a difficult defecation. The polypus is usually of the mucous variety.

Treatment.—The removal of the polypus is readily accomplished, if, directly after a defecation—when it descends outside the anus—it is caught and pinched off with the finger-nails, or its pedicle tied. In order not to have to wait too long for an evacuation, a dose of senna, or some other cathartic, may be administered to the child a few hours before the appointed time for the operation, because, by the tenesmus thus produced, the polypus will most certainly be protruded, and will remain out an unusual time.

(13.) PROLAPSUS ANI.—Two conditions are described under the name of prolapsus of the anus, differing considerably from each other, namely (1), a simple protrusion of the lower folds of the mucous membrane, and (2), an invagination of the upper part of the rectum into the anus, which makes its appearance external to the anus.

The rectum, as is known, may be divided into three portions, an upper, middle, and lower (Pl. III., Fig. 4, *a*, *b*, *c*). The upper portion joins the sigmoid flexure, and, like it, is covered by peritonæum, has a cylindrical form, and runs from above downward, and slightly from left to right. This portion forms almost half of the entire rectum, and extends from its junction with the sigmoid flexure to a line where the peritoneal covering ceases (Pl. III., Fig. 4, No. 3). Posteriorly the rectum loses this covering higher up than it does anteriorly, where it is continued to a point opposite the third sacral vertebra. The middle portion (*b*) begins where the peritonæum leaves the rectum, and where it is adherent to the sacrum by loose cellular tissue only, and joins the bladder and prostate in the male, and the vagina in the female. This portion is remarkable for the strength of its longitudinal fibres, while its circular and transverse are but imperfectly developed. In constipation, it may become enormously distended, and harbor large quantities of hard, feculent matter. The third portion (*c*) is the shortest; it reaches from the prostate gland downward to the anus, and possesses a thick layer of transverse muscular fibres, the two sphincters ani.

Either this sphincter, or lowest part of the rectum, may become simply everted, and present a bluish-red or pink colored puffy mass with a central opening, or the middle section of the rectum (*b*) may become invaginated in the lower and hang down from the anus, a pink-colored or livid mass several inches in length, the color depending upon the degree of its constriction by the sphincter. A simultaneous eversion of the sphincter portion and invagination of the middle portion do not seem to happen. In the simple eversion of the sphincter portion, the examining finger may force its way into the central opening, and will generally reduce it, but, in the prolapsus of the middle portion, the finger or the probe may pass alongside of the prolapsus for one or even two inches before reaching the upper flexion.

Etiology.—Eversion of the sphincters, or, at least, a partial prolapsus of their mucous membrane, occurs extremely often in small children. It will generally be found that diarrhœa has preceded for some time, and that, as a consequence, the mucous membrane has become gorged, puffy, and flaccid, and the sphincters enfeebled. Persistent constipation may also give rise to prolapsus, the rectum seeming to be forced out by the hard and large fecal masses. Invagination of the middle portion, however, occurs oftener from this cause than eversion of the lower. In young pups afflicted with the so-called distemper, large invaginations of the middle portion of the rectum are frequently observed.

The *prognosis* is favorable in both these conditions, if the children are in other respects healthy and well nourished, and a radical cure may be achieved without an operation, but in atrophied children it is unfavorable.

Treatment.—As regards the general treatment it is manifest that astringents should be employed in prolapsus from diarrhœa, and that mild laxatives are indicated in prolapsus resulting from constipation. To the former class, opium, the mucilaginous and vegetable astringents, and the nitrate of silver and alum, belong; to the latter, rheubarb and the neutral salts in small doses. Castor-oil is very difficult to administer to small children, who usually refuse to swallow it, or reject it by vomiting.

The reduction of the prolapsus is less a question *how* to do it than when it is to be performed. It is of first importance that it be reduced at once, and we should so instruct the parent or nurse, giving at the same time the rules for doing it. These comprise the laying of a piece of lint, smeared with simple cerate, upon the prolapsed bowel; then, seeking the central opening with the finger, thrust it well into the bowel, carrying with it the prolapsed portion. After the prolapsus and finger have thus found their way into the anus, the finger is slowly withdrawn with rotatory motion. The piece of lint may be readily pulled out without danger of inducing the prolapsus anew. In winter, or where ice is readily at hand, it is very useful to slide a small round piece of ice into the prolapsus before the reduction is undertaken, and then to reposit the protruded bowel with the ice.

In atrophic children the prolapsus will always recur, no matter how often it is reduced, though cauterized or burned. In well-developed children this treatment is generally sufficient to cure the affection, but, when the disposition to prolapsus has existed for a long time, a few longitudinal applications of lunar caustic, or fuming nitric acid, may become necessary. I have never yet been compelled to use the actual cautery in this affection.

In order to prevent the straining to which some children are addicted from mere habit, it is advisable to set the chamber upon a footstool, so high that the children will not be able to reach the floor with their feet, a position which will prevent them from exercising any very great abdominal pressure. Experienced nurses know the value of holding children, thus afflicted, suspended in the air during defecation, and at the same time of compressing and supporting the anal orifice as a means of preventing the prolapse of the bowel.

(14.) MALFORMATIONS OF THE ANUS AND RECTUM.—We have two kinds of malformations of the anus; (*a*) a constriction and (*b*) a closure.

(*a.*) *Constriction of the Anus.*—A moderate degree of constriction rarely produces marked symptoms so as to require surgical aid. This is especially true of children during the first year of life, because their fæces in the normal condition are never solid, but always in a semi-solid state and formless. The condition becomes troublesome only when constipation supervenes. Evacuation of the bowel then becomes difficult or impossible, and tympanitis and even symptoms of intestinal stenosis appear. If the hard alvine matter can be softened by frequently-repeated clysters, it will then be discharged, and all the symptoms will disappear. The same result may be obtained by laxatives, but their action in these cases is always attended by severe colic-pains.

Sometimes, however, children are born with such a degree of constriction of the anus, that even the discharge of the meconium is delayed and attended with difficulty. It is sometimes such as to render it impossible to introduce an ordinary probe into the rectum. Here, of course, a small surgical operation is indispensable, and is best performed by introducing a grooved sound, dividing the constricted anal opening upon it with the knife, and then dilating it to one-third or one-half of an inch. Pledgets of lint, smeared with cerate, must then be introduced into the wound for several weeks, in order to prevent a too early closure; this, with the passage of the fæces several times a day, prevents the formation of contracting cicatrices.

(*b.*) *Occlusion of the Anus* (*Imperforatio Ani*).—In order to thoroughly comprehend the pathological history of this condition, it is necessary to consult embryology. We are there informed that, at a very early date of embryonic life, a connection exists between the bladder and rectum, by which the former serves as a cloaca, and that the rectum originally terminates in a *cul-de-sac*, that this *cul-de-sac* extends downward into the lesser pelvis, where it meets a similarly blind projection of the external integument, the rudiment of the anus, and that not till a mutual fusion of both these sacs has taken place, and disappearance of the opposing terminal sac-wall, is a communication established between the rectum and anus.

The following arrests of development may occur, systematically delineated on Pl. III., Figs. 5–9.

(1.) The rectum is fully developed, but in the natal fold, where the anal depression is usually found, nothing of the kind is to be seen, but the blind extremity of the rectum reaches to the cutis, which it is unable to perforate. This is the simplest and most favorable kind of *imperforatio* or *atresia ani.* The meconium that accumulates after the delivery of the child distends the rectum, bulges out the integument beneath, at the spot where the rectum terminates, and a simple crucial incision is sufficient for the formation of an anus (Fig. 5).

(2.) In this condition the anal depression has developed itself normally, but is unable to reach the blind end of the rectum, because it has either been arrested in its growth (Fig. 6), or it terminates in the vagina (Fig. 8), or in the bladder (Fig. 9). In these cases the simple inspection of the anus supplies no explanation, for this part is as normally formed as in every healthy child. The non-appearance of the meconium during the first twenty-four hours, restlessness of the child, a tympanitic and distended abdomen, and refusal to take the breast, usually first call the nurse's attention to the state of the bowels. Relief is sought in clysters, and the discovery is made that the pipe of the syringe either does not go in far enough, or, even when this difficulty does not exist, that the clyster is instantly returned. If the examination is now made with a probe or silver catheter, it will be found that the anal depression terminates in a *cul-de-sac* one or two inches deep.

(3.) There is in this condition neither an anal depression or *cul-de-sac*, nor has the blind extremity of the rectum grown down so far as to be traceable, after birth, by an outward bulging of the integument (Fig. 7). In these cases, generally, no sign of an anal depression is observed in the fissure between the nates, and there is no guide by which to judge of the state of the rectum, the blind extremity of which terminates in the lesser pelvis at a distance of two or three inches from the integument. Sometimes a firm, compact cord runs from the sigmoid flexure to the cutis, which may be regarded as a rudimentary rectum, and renders important services in searching for the blind extremity of the bowel.

(4.) The rectum does not terminate externally, but in the vagina, bladder, or in one of the ureters, conjointly with which an anal depression may or may not be present (Figs. 8 and 9). In this condition the meconium is not absolutely retained, but passes off with the urine in one case, and by the vagina in the other. The diagnosis may be made with ease by examining the bladder with a silver probe or small catheter, and by collecting the urine that contains the meconium; and still more easily when the orifice of the rectum is discovered in the vagina. Various are the effects of this malformation. In cases where the rectum communicates with a ureter or with the bladder, the urine always becomes alkaline, constantly irritates the mucous membrane of the bladder, and causes cystitis, atrophy, and death. But, when the rectum terminates in the vagina, it produces a disgusting infirmity, from the continuous flow of the fæces, which are not retained, on account of the absence of the sphincters. The child is always soiled about the thighs and always emits an odor of fæces, yet it is by no means incapable of living. Instances have occurred where the rectum has been established by an operation, and then the connection between the bowel and vagina became occluded.

(5.) Finally, there are cases in which the rectum does not exist at all, or only in a rudimentary form. A portion of the large intestine is only present, and that terminates in the umbilical region, as a result of the embryonical *ductus omphalo-entericus* having remained open, a condition that has been denominated *anus præternaturalis* or *Ectopia ani.*

Treatment.—The treatment, naturally, can only consist of an operation. In the cases spoken of in sec. 1, the operation will be, as already indicated, to make a simple crucial incision through the outward bulging integument, when the meconium will be speedily evacuated. A pledget of lint with cerate is introduced into the wound after every evacuation from the bowels, for the first few weeks, in order to prevent union of the lips of the wound.

In the cases mentioned in sec. 2, a cautious attempt should be made to find and puncture the rudimentary rectum by the aid of an ordinary large trocar, such as is commonly used in paracentesis abdominis. The soft, fluctuating tumor will materially aid us in discovering the cloaca. An elastic catheter cut off at the top is then introduced through the trocar canula, and through it warm water is injected three or four times daily to liquefy the fæces. After several days the catheter should be replaced by one of larger size, and this practice is persevered in till the defecation can take place regularly and without any difficulty. Generally the sphincters of the anus exercise their functions tolerably well, but a disposition to constriction often remains, which must be combated by the use of bougies.

In the form of atresia ani described in sec. 3, a crucial incision to the depth of one inch must first be made over the spot where the anus normally occurs; the blind extremity of the rectum may then be sought with the finger, and, when found, is treated with the trocar in the same manner as in the cases described in sec. 2. That these operations frequently prove fruitless, and even when the rectum is opened often terminate fatally, might be anticipated from the feebleness of the new-born child.

In cases where the rectum communicates with the bladder, the effort must likewise be made, as rapidly as possible, to secure a passage for the fæces by some other channel, because, if not done, a fatal result is inevitable. But, in the cases where the rectum terminates in the vagina, there is less urgency for an operation, as this condition may be tolerated for a very long time; indeed, instances are known where children have grown up with this malformation, without any surgical assistance. As soon as the child has acquired sufficient strength, an attempt should, however, be made, even in these cases, to establish a proper anus. The communication with the vagina will then either become occluded of itself, or it may be very easily remedied by a small operation.

If, in such cases as are described in secs. 2 and 3, it be not possible to find the rectum, then, according to the laws of surgery, an artificial anus should be made in the left lumbar, or in one of the inguinal regions. That children may recover from such an operation has often been shown, but whether they thrive and grow up I am not able to say. At least, I have never seen an adult in whom an artificial anus had been established in any of these places in the early days of life.

(15.) INFECTIOUS DISEASES WITH PREDOMINATING LOCALIZATION UPON THE INTESTINAL CANAL. (A. *Typhus Abdominalis.*)—Abdominal typhus is much more frequent in children than is commonly supposed, but the diagnosis in many cases cannot be made with certainty, and, on this account, many physicians attribute to children great resistance against this disease. Their liability to infection, if such can be assumed, is an extremely small one, and is not at all to be compared with the other infectious diseases, measles, scarlatina, and pertussis. While it often happens that the children of several families in one house are simultaneously attacked by typhus fever, usually of a mild form, still it more frequently occurs that only one child out of a numerous family is seen to fall sick with it, all the rest remaining well, although all have occupied the same room, and none of them have been protected by previous fever. Typhus fever is extremely rare in children before the completion of the first year of life; still individual cases are found recorded of nurslings who perished by this disease, but it is observed that no *typhous intestinal ulcerations*, simply *infiltration* of Peyer's patches and of the mesenteric glands, are spoken of in the reports of the *post-mortem* examinations afforded by these cases. In the second year of life, and after the completion of the dentition in the third year, abdominal typhus becomes extremely frequent, and is attended by tolerably characteristic symptoms, and from this age onward it may occur at any age and at any season of the year.

As the plan of this treatise presupposes a thorough knowledge of special pathology and therapeutics derived from other sources, hence only the deviations peculiar to the infantile age can properly come within its scope. Nor does a critical examination of the present prevailing opinions regarding contagious diseases, and the connection of the local with the general affection, belong to it. But this much must be said in this connection: (1.) That the conditions found in the alimentary canal do not stand in exact relation to the general disease; and (2.) That no qualitative nor quantitative alterations have ever yet been found in the blood of typhous patients. The changes in the blood of typhous patients, who have been ill for many weeks, are the effects of protracted disturbances in the textural metamorphosis, and of the circulation; and the so-called typhous blood, by which a dark, violet-colored liquid blood, with soft, loose coagulæ, is understood, is not invariably found in the typhus cadavers, but yet in the cadavers of most patients whose diseases were combined with disturbances of respiration and assimilation.

Post-mortem Appearances.—In general, a first and a second period can be distinguished in the typhus corpse.

If death takes place in the *first period*, the typhous morbid changes will only be found in the small intestines, in the mesenteric glands, in the spleen, and upon the bronchial mucous membrane.—The cadavers are not emaciated, have deep-blue *post-mortem* spots, and the muscles are dry and dark colored. The brain is firm and dry. The bronchial mucous membrane is reddened, swollen, and everywhere coated with a tenacious, yellowish-white mucus, so that in some places the bronchi of the third order are completely filled up with it. The infallible consequences of this overfilling of the bronchi with mucus, especially posteriorly and inferiorly, are disturbances of circulation in the pulmonary organs, hypostasis, and ultimately splenization. The heart is extremely feeble, contains very loose coagulæ, and its muscular structure at some places is blanched. These pale spots exhibit, under the microscope, commencing fatty degeneration. The spleen is enlarged, and the enlargement affects particularly its long diameter. Its capsule is tensely distended, its structure very dark and soft, and often of a semi-fluid consistency.

The abdomen is distended, the bowels are tympanitic, and contain a large quantity of intensely-offensive fluid; almost the whole mucous membrane of the small intestines is in a state of acute catarrh, and Peyer's patches, as well as the solitary follicles, are peculiarly infiltrated. The hypertrophy of the glands just mentioned is produced by a deposit of a grayish-white medullary mass, which principally fills up and swells the capsule of the glands, but involves also the submucous and even the mucous tissue itself. The morbid changes and course of these infiltrations in children deviate somewhat from those observed in the adult. While the great majority of typhus cadavers of the adult display ulceration of the glandular patches, in children this is only an exceptional occurrence, for the infiltration, in most of these cases, seems to undergo a retrograde metamorphosis, or at least a simple bursting of the capsule and evacuation of its contents without any cicatrization. Although, in rare instances, true cicatrization or ulceration has been found, they are nevertheless but isolated instances in which one or more patches only have been implicated. The majority of Peyer's patches always stop at the stage of the brain-like infiltration, and this, in fact, also explains the reason why intestinal hæmorrhage and perforations are so extraordinarily rare in children. The younger the child, the less frequently are ulcerations met with. I have never yet found them in children under four years, although I have dissected many children, of from two to four years of age, which died from undoubted typhus fever.

The mesenteric glands become affected in exactly the same manner as Peyer's patches. They enlarge to three or four times their normal size, and, when cut into, are seen to be yellowish gray and brain-like. Their size appears to depend upon the amount of infiltrating material deposited into them; Peyer's patches are to be found opposite the ileocæcal valve; so also the mesenteric glands opposite this valve are most hypertrophied.

If the cadaver of a child which died in the *second stage* be dissected, the first thing that will attract the attention is the extreme emaciation. The skin is pale and flabby, the *post-mortem* spots are not so intensely violet, the muscular system is pale and œdematous, and infiltrated with serum. The integument often exhibits bed-sores, pustules, sudamina, and ecchymosis; sometimes the lower extremities are somewhat dropsical. The parotid gland may be swollen and permeated by purulent sinuses. Perichondritis and necrosis of some of the laryngeal cartilages are sometimes observed in the larynx; the lungs reveal a still greater amount of splenization than in the first period, and the bronchi are filled with mucus. The spleen is swollen and corrugated, the mesenteric glands are enlarged, and abscesses are sometimes formed in them. Peyer's patches and the solitary follicles are slightly tinged with a grayish pigment; the capsules are mostly ruptured, giving the whole glandular surface a reticulated appearance; and when, in older children, solitary ulcerations have occurred, they will be seen undergoing cicatrization. If the children have succumbed to pyæmia, the well-known purulent effusions and embolic formations will be found in the serous sacs and parenchymatous organs. If they have perished from anæmia and scorbutis, marked serous effusions in the cavities of the body and in the subcutaneous tissues will be found. In scorbutis the morbid condition of the gums will have become superadded. The brain, in contrast to the first period, is extremely moist and soft, and is with difficulty removed entire from the cranial cavity. The rarity with which ulcerations of Peyer's patches occur makes it easy to confound this pathological condition with that found in enteritis folliculosa. But the hypertrophy of the spleen and the state of the lungs are sufficient to distinguish typhus fever from follicular enteritis.

Symptoms.—As may already be inferred from the description of the *post-mortem* appearances, the morbid alterations and destruction which typhus fever brings about in the infantile organism are not so decided as in the adult; and, correspondingly, the symptoms are usually also less intense and threatening, and the prognosis in general favorable. The symptoms are seldom so violent and characteristic that the diagnosis of typhus fever may be formed with certainty at first sight, as an experienced observer may usually do when he approaches the bedside of an adult patient seriously sick with it. The diagnosis is very liable to vacillate between typhus fever and acute hydrocephalus, and upon this difficulty in the differential diagnosis many of the recoveries from supposed acute hydrocephalus rest. In most of the cases, however, children have so mild a form of typhus fever, that it is confounded with gastrocismus or dentition troubles, and consequently less apprehensive parents do not seek any medical assistance at all. Physical diagnosis furnishes little, if any, aid in this mild typhus fever of children. The spleen does not become materially enlarged, the abdomen is not much distended by gas, and the bronchial catarrh attains to no alarming degree. The diarrhœa is moderate, the children are quiet, do not complain of pain, and sleep a great deal. The marked and protracted lassitude, the continued loss of appetite, and the tedious convalescence, during which the hair always falls out, and is at first replaced by a thinner, lanugo-like crop, are the most characteristic symptoms of a lingering febris typhoides, which in Munich is popularly called " mucous fever."

Yet it cannot be denied that individual children, especially after they have completed the first dentition, may display very severe and complete symptoms of typhus fever, and it is therefore necessary to subject them to a special analysis.

First of all, as regards the *chronology*, there is no acute disease in which it is so difficult to decide the period of invasion as in typhus fever; nevertheless, this is usually easier in children than in adults, since their tenderer organism is much more violently disturbed by an infection, and its commencing action. And, besides, they are neither compelled by necessity nor occupation to struggle against the disease as long as possible, notwithstanding its growing severity, and therefore their early symptoms are unmodified. The day on which the child loses its accustomed spirits, and lies down and falls asleep at unusual hours, when followed by the more characteristic symptoms, is to be regarded as the commencement of typhus fever. The child sometimes retains its appetite up to the same day, but usually it vomits the whole undigested meal at the end of a few hours, when the symptoms of typhus fever, as a rule, come on quicker and are severer than when no vomiting has taken place. I have never observed any distinct chills, and consequently can place no value upon them in deciding the day of invasion. When typhus fever develops itself during dentition, it will scarcely be possible to decide its commencing period, for here the almost physiological diarrhœas and congestions of the head pass over very insidiously into the typhous symptoms. Typhus fever in children may, as respects its duration, run a course as irregular as it does in the adult, and therefore no definite conclusion can be formed, as to its course and duration, from the violent appearance of the first symptoms. Some children recover quicker from an intense typhus fever than others do from a very mild, lingering febris typhoides. In general, however, it may be assumed that a child, which has recovered completely in less than three weeks without marked emaciation, *has had no typhus fever, nor even a febris typhoides*, because children affected by those diseases are retarded in their development and nutrition for more than three weeks.

The extent of febrile phenomena in children cannot be so readily expressed as in the adult, such as the pulse, temperature of the skin, and the amount of urine excreted. The restlessness of a typhous child interferes with the use of the thermometer to determine the temperature of its skin, because, as is well known, the instrument must be entirely surrounded by integument, and allowed to lie quietly for from fifteen to twenty minutes. It is, therefore, better to observe the warmth of the forehead, trunk, and extremities, with the hand, previously warmed, no matter under what disease he may be laboring, and this kind of examination, practised a few hundred times, gives such an amount of skill, in distinguishing the different degrees of temperature, that thermometric measurements, always requiring a certain amount of time, and often totally impossible, will be entirely unnecessary for any practical purpose. As to the pulse, upon whose condition and frequency in adults so great value is justly placed, it gives less positive indications in children. It is always extremely rapid, up to 160 and 170 beats in the minute without being attended by corresponding danger, or rendering the prognosis particularly unfavorable. During convalescence it may be compressed with the utmost ease; in the mortal agonies it becomes uncountable and imperceptible. An intermittent pulse seldom occurs in children, and I do not remember to have ever met with a dicrotic pulse in children under ten years of age.

Of the subjective febrile symptoms, the prostration, the excitability, and the lethargy, are always the most important. Hardly ever do children suffer any decided chills; the head is always flushed, the eye heavy, and in patients greatly excited presents a peculiarly glistening appearance. The expression of the face is either that of apathy or of great excitability, or, in the most violent cases, of confusion.

Very soon the *assimilative functions* assume an extremely unfavorable condition. The loss of appetite, and the uncontrollable, profuse diarrhœas on the one hand, and the urine, rich in excretive material, on the other, explain sufficiently the rapid emaciation of typhous children. I have often endeavored to extend, in the case of children, my investigations of the urinary substances, which, for years, I have carried out on a very extensive scale in adults. But all my efforts foundered on the impossibility of obtaining the urine which children under ten years of age pass in the twenty-four hours. Isolated opportunities for the investigations of the urine always showed in typhous children 2.5 to 3.5 per cent. of solids. As, judging by the eye, they pass a tolerably large amount of urine, it may be fairly inferred that, in typhus fever, children, as well as adults, lose a large quantity of urinary solids. It is a remarkable fact that the emaciation progresses and only attains its climax when the appetite has already fully returned and the patients are steadily convalescing. If sequelæ, such as tuberculosis, scorbutis, phlebitis, in various cutaneous veins, or large abscesses, supervene, the child will often be reduced to a mere skeleton, but the prognosis need not on that account necessarily be assumed as absolutely desperate, for such children occasionally manifest a wonderful resisting power, and finally, after many months, recover. After every intense typhus fever, children lose their hair almost completely. It returns slowly, first very thin and lustreless; ultimately, however, it grows stronger, acquires its original color and fulness. In the usual milder forms, in which the prevailing typhous symptoms are only imperfectly developed, the falling out of the hair is less marked.

The most important alterations always take place in the *digestive* system. Anorexia is one of the most constant symptoms, usually complete, but sometimes attended by peculiar longings, such as for rye-bread, fruit, etc., articles which, in fact, may be allowed the child without any great danger, so long as the precaution is taken not to indulge it with too large quantities at a time. Generally it plays with the food placed before it, carrying a little to the mouth from time to time, but, in most instances, does not swallow even that, but spits it out again, and so the craving for food is appeased. The anorexia lasts as long as the febrile symptoms continue, during which time the greatest difficulty will be experienced in supporting the children in any manner, fluid food being almost exclusively available. After a while the appetite returns, and in a few days becomes a ravenous hunger, the indiscreet gratification of which often causes serious relapses.

In children the tongue seldom becomes as dry as in the adult, because they almost always sleep with the mouth shut, and thus the main cause of the dryness of the tongue is wanting. In most instances it is rather thickly coated, and the papillæ are seen to be dark red, but in grave cases the characteristic brown, dry, furred tongue of typhus fever is present.

The *lips* desquamate and bleed a good deal, especially in older children, who pick almost incessantly at them. The so-called sooty coating of the lips is the result, in this disease, of the blood drying upon their surface. The fetor of the mouth, which in adults is so fearfully disgusting, is less intensely marked in children.

The *parotid* gland occasionally swells up in typhous children, and is always to be regarded as a most dangerous symptom. It is not possible to say with any certainty whether all kinds of parotitis are of a metastatic nature, for the catarrh of the mouth may indeed be directly propagated to the Stenonian duct and even to the salivary gland itself. But the dangerous character of this complication and the fatal termination that ensues in most instances make it probable that, in the majority of cases the cause of the parotitis is an actual metastasis, and not a simple propagation of the catarrh. It invariably terminates in suppuration, and, if life continues sufficiently long, the gland undergoes purulent degeneration. In the cadaver a number of small abscesses, of the size of pins' heads, are always found associated with larger ones.

The morbid phenomena are usually ushered in with *vomiting;* young children often vomit several times a day during the whole course of the disease, owing to which, when unattended by diarrhœa, it becomes extremely difficult to diagnosticate the disease under consideration from acute hydrocephalus. This obstinate vomiting is due to a profuse gastric catarrh, as is shown by the fact that the patients not only throw up the little fluid nourishment they consume, but also considerable quantities of mucus, through which they become rapidly atrophied and usually succumb to the disease. The vomiting which accompanies perforative peritonitis in the adult is rarely seen in children, for the simple reason that the inducing cause, perforation of the intestines, scarcely ever occurs.

The *abdominal pains* and tenderness which accompany this disease in the adult are hardly ever complained of, and difficult to be elicited, in children under two years of age; they occur only occasionally in older ones, and are not very severe. The importance of *gurgling in the cœcal region*, which was formerly described as a pathognomonic symptom of typhus fever, has deservedly fallen into disrepute, for it is just as frequently found in every intestinal catarrh.

The tympanitis attending those cases in which the ulceration is limited is not very great, and consequently its effects, such as impeded respiration, from the pressure of the diaphragm upward, pulmonary stenosis, and cyanosis, occur only in milder degrees.

The *intestinal evacuations* differ in no respect from those in the adult. Diarrhœa is not usually present during the first few days of the disease, but it always comes on later, though laxatives may not have been used, and constipating drinks may have been given; from twenty to thirty dejections taking place during the day. A collection of all the stools evacuated in the twenty-four hours, in children, is of course altogether out of the question, but it may approximatively be stated that, according to the weight and space, typhous children discharge three or four times as much as healthy ones. The quantity discharged in the twenty-four hours does not always stand in relation to the number of evacuations; some children discharge a larger quantity of typhous fæces in two or three stools, than others do in ten or twelve, the number depending entirely upon the irritability of the rectum.

If the stools are very thin, they will be of a light-brown color, and when allowed to stand quietly will separate themselves into two layers, an upper, clear, and fluid, and a lower, semisolid part. The latter consists of fine white and yellow flakes. True, strong drastic purgatives repeated several times in succession produce stools, which, as regards the color and formation of the layers, cannot be distinguished from those of typhus fever, but such drastic remedies are now scarcely ever employed even in the least rational methods of treatment. We therefore have, in the formation of the layers, an important aid in the diagnosis of typhus fever. The absence of very profuse diarrhœa does not by any means prove the absence of typhus, for it is common to see children, after they have passed the second dentition, who, during the entire illness, are obstinately constipated, and in whom an evacuation has to be produced by clysters. The microscopic investigation of the yellowish flakes composing this lower layer reveals first of all: (1.) A totally formless granular mass, but little susceptible to reagents; (2.) Intensely yellow-tinged scales, of pavement-epithelium (whole cylindrical epithelium cells are but very rarely seen); (3.) Brown, finely-granular corpuscles of various size and without membranes, as may be readily seen by cautiously compressing them; (4.) Large brown, often double-contoured round or oval, and sometimes distinctly rhomboid, refracting bodies; (5.) Triple phosphates; and (6.) Infusoria, the constant accompaniment of every putrefaction. These are objects which also exist in diarrhœic stools, and consequently are not pathognomonic of typhus fever. Nor is chemistry able to demonstrate a peculiar typhous material. Typhous stools generate more sulphohydrogen gas than diarrhœic, a fact which may be proven by paper moistened in a solution of sugar of lead, and that they contain a greater amount of ammonia can be shown by testing them with reduced litmus-paper, which they turn intensely blue.

Nothing can be gathered, to show any difference between typhous and diarrhœal stools, from the quantity of the salts, the various analyses of which I have had an opportunity of presenting more in detail in a former work.

These profuse diarrhœal evacuations generally last from eight to fourteen days; then constipation sets in. Comparatively speaking, it is rare for diarrhœa to last longer than that period in children, as the intestinal complication in them is less intense than in adults. So long as the children are feverish, they discharge the contents of the bowels in bed, but it is necessary to discriminate between simply frequent involuntary discharges, the consequence of inattention, or the blunted state of their sensorium, and the constantly oozing away from them of liquid fæces, owing to the paralysis of the sphincters. The former condition is a common one, and denotes a very severe typhus, but its prognosis may be favorable. The latter, on the contrary, is a symptom of the utmost exhaustion and profound depression of the nervous system, and is to be regarded as an unfavorable sign.

Typhous *intestinal hæmorrhage* and *intestinal perforations* are exceedingly rare in children; their symptoms and consequences differ in no respect from those occurring in adults, and it is assumed that they are sufficiently familiar to the reader.

In some malignant epidemics, a croupous process of the large intestines becomes associated with the disease during the third or fourth week, when the children will discharge dysenteric stools, sink rapidly into a state of collapse, and perish comatose, or during a convulsive attack. At the autopsy, an extensively-developed croupous membrane is found upon the mucous membrane of the large intestines, accompanied by ulcerations in various stages, such as have been more minutely described in dysentery.

The *spleen* is generally enlarged, but its change is demonstrated by physical examination with much more difficulty than is usually supposed, this difficulty being subject to unavoidable and incalculable fluctuations. In a healthy child of one to two years old, a slight dulness over a space of barely one inch in length, and one-half an inch in breadth, may be detected on the left side, between the eighth and ninth ribs. A perpendicular line drawn from the middle of the axillary cavity to the great trochanter intersects this spot. The normal spleen lies with its long axis parallel to that of the body, the lower border projecting a little forward; but, when it becomes enlarged, its position becomes more and more horizontal; still the lower end always remains slightly deeper than the upper. In progressive enlargement, the lower border grows forward and downward, reaching toward the cartilaginous border of the ribs, and pushes itself anteriorly along the abdominal wall, while the upper posterior end of the spleen develops posteriorly along the course of the ninth rib toward the spinous processes, so that, in percussing the back between the spleen and spinal column, only a narrow sonorous stripe is now found. The larger the spleen becomes, the more does it pass out of the horizontal into the perpendicular position. In typhus fever the spleen may become enlarged to three or four fold its normal size, and the hypertrophy is found to be disproportionately greater in its longitudinal diameter than transversely.

The splenic tumor of typhus is always easily movable, and with every deep inspiration is pushed downward, a fact that may be more easily ascertained by percussion than by pressure with the finger over the border of the ribs. It is particularly remarkable how difficult it is to feel a hypertrophied typhus-spleen, which often projects over the borders of the ribs. This is explicable by its extreme softness and great mobility. The principal amount of swelling of the spleen takes place in the first and second week; in the third week it begins to decrease, and on the fourth has become reduced to its normal size.

The tympanitis of the alimentary canal, which is naturally sometimes variable, according to the predominance of the catarrh and the retardation of the peristaltic action, is a great obstacle to the examination of the enlarged spleen. The increased amount of space occupied by the intestines is not effected at the expense of the abdominal walls alone, but at that of the rest of the abdominal viscera also. The liver turns its sharp border more and more upward, and presses the diaphragm further up, *but the spleen is pushed upward and backward, and invaginates itself in the distended intestines*, in which position even a very decidedly enlarged spleen cannot be detected by percussion. The diagnosis of typhus fever would therefore frequently be impossible, if the demonstration of the splenic tumor were to be regarded as essential. It does not, by any means, follow from this, that the percussion of the spleen is to be omitted as useless; it should only be borne in mind that a greater dulness in the splenic region is not constant, and that consequently a well-marked typhus fever may exist without such dulness.

Embolic inflammation of the spleen arises only in pyæmia, and is rarely seen except in children in hospital.

The morbid alterations of the respiratory organs are just as constant as those of the digestive organs. All typhous children have bronchitis and cough, but those under five or six years of age regularly swallow the mucus which is loosened by cough and thrown into the fauces. The more intense the disease, the more insignificant and less frequent is the cough; not that the bronchitis is milder, but that the sensibility of the mucous membrane is so blunted that the accumulated masses of mucus no longer excite the acts of coughing. On auscultating the lungs, large and small sibilant râles are heard everywhere. The accumulated mucus ultimately produces an occlusion of the smaller bronchi, and the well-known *hypostatic splenization* then results. These are only to be found in the posterior and lowest parts of the lungs, diminishing the resonance upon percussion in these regions. But the well-declared dulness of a pneumonic lung is not found in these cases, and the detecting of the finer variations of the percussion-sound is rendered very difficult here, by the circumstances that the splenization, in most instances, occurs in both lungs, and therefore a comparison of the percussion-sounds on both sides is impracticable. Sometimes distinct bronchial respiration is heard over the splenizated portions, but whether at first, or when the splenization takes place, or at the end, when, in rarer instances, it undergoes resolution, can any pathognomonic crepitation, such as is heard in pneumonia, be discovered. As the splenization increases, the breathing becomes accelerated, the alæ nasi rise with every inspiration, a symptom upon which, in the difficulties attending the physical examination of the chest of restless children, too much attention cannot be bestowed. Slight cyanosis at length supervenes, the cerebral symptoms become intensified, the frequency of the pulse augmented, and the children slowly succumb. Small splenizations seem to be capable of undergoing resolution, larger ones almost always destroy life. The convalescence, when splenization has taken place, is always protracted, and the cough does not disappear entirely till after many months.

Lobular pneumonia is frequently met with in the dissections of children who die of typhus, and may occur in the splenizated as well as in the sound parts. They are recognized by their firm, fixed exudation, and the granular appearance of the cut surfaces. We have no diagnostic signs for this condition; for the accelerated respiration, the movements of the *alæ nasi*, and the extraordinarily rapid pulse, are equally constant in a splenization, in a diffused typhous bronchitis without splenization, and in lobular pneumonia. Such circumscribed consolidations of the pulmonary tissues cannot be detected by auscultation and percussion.

Œdema of the lungs is also frequently observed in the dissections, and seems to be the effects of prolonged imperfect respiration during the last hours of life. Pulmonary tuberculosis may develop itself rapidly in children who inherit such a disposition. It does not usually appear till after recovery from the fever, but is much rarer after typhus than after measles, as a result of which it manifests itself in a great many children. Recurrence of fever, increased cough, and expectoration, allow its existence to be surmised, though the physical examination seldom positively confirms this suspicion in the beginning. The *bronchial glands* are frequently found so much enlarged as to have aggravated the dyspnœa, but their hypertrophy cannot be diagnosticated.

Abscesses of the larynx are said to have occurred, though I have not met with a simple laryngeal abscess in my dissections. In some there were present perichondritis and necrosis of the cartilages. Usually the laryngeal affection first comes on in the third or fourth week of a severe typhus, and belongs to the secondary symptoms. The patients suddenly become hoarse, then completely aphonic, and are attacked by a barking croupous cough and fever; the most violent dyspnœa soon becomes superadded, and they die of frightful suffocation. At the autopsy, more or less extensive necrosis of the laryngeal cartilages is found; the necrosed pieces of cartilage are bathed in sanguinolent serum, and the glottis is œdematous. Cases of spontaneous recovery, with permanent hoarseness and even aphonia, are said to have occurred, but the most experienced physicians regard necrosis of the larynx as fatal. In adults with typhous laryngeal necrosis, laryngotomy is attended by tolerably favorable results. I have seen some individuals in whom it was performed with success, and would not hesitate for a moment to undertake the operation, should I again chance to have a child with necrosis of the larynx under treatment.

Now, although, catarrhal laryngitis may also come on in typhus fever, as it may indeed in any other disease, and disappear spontaneously, or, by the aid of counter-irritants, in a few days, still hoarseness in a typhous child must always excite the greatest anxiety, and it is advisable to be ready to perform tracheotomy, so that it may be instantly done when the dyspnœa becomes so serious as to endanger life.

The *skin* of typhous children exhibits manifold alterations. A number of bright spots appear from time to time, between the fifth and tenth days after the invasion of the fever, upon the breast and abdomen, but very seldom and sparsely on the rest of the body. These spots vary in size from a pin's head to that of a lentil, disappear on pressure, but instantly return, with uniform redness, so that it is impossible to decide whether the redness recurs from the centre to the periphery, or *vice versa. Roseola typhosa, taches lenticularis.* Generally they are on a level with the skin, only exceptionally do they become elevated above it after the manner of morbilli; they have no connection with the hair-follicles, and sudoriparous glands, and are not perceptible to the patients themselves.

It is not always very easy to distinguish between roseola typhosa and flea-bites. But flea-bites are brought into the disease, fade more and more daily, and are not replaced by new ones, because fleas forsake all febrile patients, while the exanthema of typhus fever does not appear for some days after the child has been seriously sick.

The eruption of the typhous exanthema does not take place at once, the course is by no means typical; some spots remain for a longer, others for a shorter period; while some have already faded, others appear again on new places, and herein we have important distinctions from the acute exanthemata. Typhous roseola always lasts several days; when an exacerbation of the fever takes place, it becomes darker; when a remission ensues, paler, and finally fades to the normal color of the skin, having passed through a brownish or yellowish-red tint. Almost all seriously sick typhous children present these roseola spots;.in milder forms of typhus abdominalis they are not seen. The number of spots is of less consequence in reference to the prognosis than the color and duration of the eruption; the bluer the spots, the more dangerous is the condition.

The *perspirations* are seldom critical in typhus fever. Some children perspire from the very beginning, though the typhous symptoms are becoming more and more aggravated; others pass into a perfect convalescence with a barely moist skin.

In most typhous children *miliaries* appear in great numbers. They have no critical and still less any unfavorable signification, and it is wholly inexplicable how such a dreadful fear of these harmless little sudamina has arisen among the laity of all classes. The manner of their origin is extremely simple. As a result of the cessation of the perspiration at the commencement of the fever, the epithelial cells lining the excretory ducts of the sudoriparous glands become dry, are cast off, but not washed away, forming a dam, which the perspiration, that has been arrested for some time, but which now, suddenly reëstablished and profusely secreted, is unable to break through, thus causing an elevation of the occluded orifice, and the similarly desiccated layer of epidermis surrounding it, to the extent of a pin's head in circumference. After two, or, at the longest, three days, these epidermial caps burst, and the perspiration oozes out uninterruptedly through the once more pervious and cleansed passage. Microchemical investigations give evidence that the contents of the miliaries are not a serous exudation of the cutis, but pure sweat, and, by placing the cap of a miliary vesicle under the microscope, it will be easy for one to convince himself that the mouth of a sweat-gland exists in its centre, which is recognized by the concentric layer of the epidermic cells, and is never seen open, but always closed by larger and smaller granules.

These miliary vesicles are found largest and in greatest abundance upon places where cutaneous irritants, sinapisms, or ung. cinereum,* have been applied. There they often attain the size of a lentil; the skin, after they burst, peels off in large patches, almost as in scarlatina, and the new cuticle for a long time has a brighter color than that by which it is surrounded. This phenomenon is also easily explained, for, by the use of unguents, the ducts of the sweat-glands are still more completely closed up, and by rubefacients a congestion of the cutis is produced, in which naturally the glandular canals must become implicated. The miliaries can be regarded as critical only to the extent that they show that the long-interrupted secretion of the sweat has again become established, a truly desirable and encouraging symptom.

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* Oxyd of mercury ointment.—Tr.

Furuncles, abscesses of the cellular tissue, and bed-sores, have totally different significations. During convalescence, an extremely painful furunculosis, principally upon the head and nape of the neck, sometimes becomes superadded, causing the child much suffering for many weeks, greatly retarding its complete recovery. The numerous subcutaneous abscesses, which appear as sequelæ of the disease, produce a like result.

Cleanly-kept children are attacked by bed-sores at a much later period than adults, and the sores are less extensive. The epidermis usually sloughs off from several small places on the back, over the sacrum, nates, or trochanters, and leaves a superficial ulcer, which, as a rule, heals by the application of some simple astringent ointment. Extensive cutaneous destruction of the skin over the sacrum, where it becomes blue and gangrenous suddenly, and sloughs off in a couple of days, may occur, perhaps, in badly-ventilated hospitals; however, I have never met with them in private practice.

On the lower extremities *petechiæ* are sometimes seen in typhous children, who lie in very damp, miserable rooms, and are affected with scurvy. They differ in no respect from those observed in common scorbutus.

Facial erysipelas is sometimes seen in the adult as a local manifestation of a pyæmic inflammation of the superior maxillary cavities, but I have never yet observed it in children.

The *head and nervous symptoms* are not so marked in typhous children as would be supposed from their general irritability. Most of the milder cases run their course, attended only by mental apathy and general depression of the spirits. In severer cases, delirium of various degrees, at first by night, later also in the daytime, comes on, followed by many hours of profound coma. The division of *febris nervosa* into a *versatilis* and *stupida* can be entertained no more in children than in adults, and only when one or the other condition has been continuous for several days may the therapeutic indication possibly become changed. Sometimes the delirium lasts only one, at other times several days, generally, however, two to three weeks, when it ceases, not at once, but gradually, and leaves behind great irritability, and weakness of memory, which in some children may remain permanent for life. Sometimes the sensorium clears up after a profuse epistaxis, after an intestinal hæmorrhage, or after a profuse diarrhœa.

The muscular weakness of typhous children is exceedingly great; most of them lie perfectly quiet upon the back, and are not even able to sit up. The usual tympanitis is, in part, also attributable to a paralysis of the muscular coat of the intestines; the hardness of hearing may be explained more simply by the fact of a mechanical interruption in the transmission of the sound, which ensues more as a result of catarrh of the Eustachian tubes, than by the toxic effect of typhous blood. The muscular weakness peculiar to typhus fever is to be distinguished from a partial paralysis of the lower extremities, which is protracted disproportionately into the convalescence, but finally passes off spontaneously, no matter whether the much-lauded electricity has been resorted to or not.

In regard to the *urine* of typhous children, and the uropoëtic system, and genitals, but little can be reported, on account of the impossibility of properly collecting the urine, and the subordinate signification of the infantile genitals in particular. I once saw diphtheritis of the vagina, and resulting gangrene of the labiæ majora and minora in a girl two years old. She belonged to a wealthy family, and was very well nursed; but, notwithstanding the most energetic use of escharotics and a general tonic and stimulating treatment, death ensued in a very few days.

Metastases, in the sense of the older school, do not occur in typhus fever. In these were included phlebitis, furunculosis, cutaneous abscesses, embolic inflammations of the parenchymatous organs, and gangrene. But since the time that the misplacement of the coagulæ and the causes of the formation of emboli have, mainly through the labors of *Virchow*, been more accurately ascertained, and since the time that the pyæmic process and its occurrence in the various cavities and organs have been more thoroughly investigated, all those theories have completely changed. Although all the circumstances are not yet fully explained, still this much has been elucidated: that they depend in greater part upon mechanical disturbance of the circulation, and hence we are not compelled to have recourse to the mysterious metastases.

Actual *relapses* but very rarely occur in children; though scarcely any typhous child progresses steadily toward a complete recovery without a longer or shorter interruption, because, urged by a keen appetite, they will eat indiscreetly if food is furnished them, and, when unable to get it, will swallow wholly undigestible substances, such as paper, etc. In children with an hereditary disposition, tuberculosis is the most frequent sequel to which they succumb after many months; in scrofulous persons, profusely-secreting exanthemata, eczema, impetigo, and malignant otorrhœa, ensue, along with which the tympanum generally becomes perforated, and the bones of the ear are discharged. The *finale* of this painful, tedious, and annoying result is total deafness. Noma is one of the exclusive complications of typhus fever of children which occasionally supervenes during convalescence, and principally attacks them in badly-ventilated and damp localities. We have already spoken of this affection at p. 97.

Therapeutics.—It is much easier to harm a typhous child with medicine than to do it good. Much injury *may be done* by the administration of *emetics* or drastic *cathartics*, although the premonitory symptoms of typhus fever may often seem to indicate such medication. I frankly confess that I have occasionally been led into this error, and have administered to an intensely congested and constipated child, presenting a white furred tongue, an emetic consisting of ipecacuanha ℈j, tart. stibiat. gr. j, and I have uniformly observed, as an apparent result, that the fever which followed was of the highest grade. That this should have been a mere coincidence, is, I think, altogether out of the question, and hence I deem it necessary to speak decidedly against the use of tartar emetic in all cases of children presenting the least symptoms of typhus fever.

Those prophylactic measures minutely described in text-books (such as ventilation, proper nourishment, occupation, etc.) certainly deserve the utmost encouragement, but they are, in most instances, more easily prescribed than secured. One has quite enough to contend with in having the typhous child transferred from the small back room, occupied by the whole family, into the so-called parlor, a comparatively vacant room, containing only a few articles of luxury. In more commodious residences, two communicating rooms should be retained and appropriated to the use of the sick child, for by this means only can a thorough ventilation be obtained. Admitting the question of infection to be extremely problematical, it is nevertheless advisable, if only to maintain the necessary quietude, that no children, and, at the most, only two adult persons, be allowed in the room with the sick child. The temperature of the room should never rise above 65° F., the covering should always be light, the mattresses tolerably hard, made of sea-weeds, straw, or horse-hair. If the typhous symptoms are already fully developed, it is advisable to have the hair cut short, by which a proper amount of cooling of the congested head is secured. Cold-water applications to it, which the laity generally carry out by dipping a thin piece of cotton cloth in cold water and spreading it out between two dry ones, and then tying it over the forehead, cools but for a minute at the most. It very soon rises to the temperature of the skin, and then it heats rather than cools, as one may easily convince himself by seeing and feeling children so treated. I do not believe that cold compresses laid upon the forehead give much relief, for, as they become warm very soon, they require to be often changed, and this act annoys the child, and thus do more harm than good. If the child be too young to listen to reason, or delirious in consequence of the disease, this manner of applying cold will not answer at all, and we will have to limit ourselves to douching the closely-sheared head every hour with cold water, holding it over a basin, while the body is protected by a cloth wrapped around the neck.

The treatment of typhus fever for the first few days must be purely expectant, for the reason that the diagnosis cannot be certainly made out, and, as has already been stated, all energetic remedies, among which may be included leeches to the temples, for the purpose of combating congestion, are injurious. Hence, we must limit ourselves, when constipation exists, to the administration of some mild acidulous drinks, composed of any agreeable vegetable acid, or to a few drops of acid Halleri, while, if diarrhœa has already become superadded, the mucilaginous agents are more appropriate. In this connection, I can say of calomel, that when given several times in medium doses, say two to four grains, it procures a certain but gentle evacuation of the bowels, without being followed by such profuse diarrhœa as tart. stibiat. or the other drastic remedies. An abortive effect from medication is, of course, altogether out of the question. This expectant treatment having been pursued for from ten to fourteen days, and neither improvement nor aggravation of the disease having become manifest, a diet of more nutritious aliment should be commenced.

The diet of typhous children depends upon their age and former manner of living. Many children, who, while in health, mainly lived upon milk food, will not taste bouillon and demulcent soups at all, which, in adults, are considered the most appropriate nutriments; and there is therefore no other alternative than to allow them also during the fever small quantities of milk, or coffee with milk, several times a day, although it cannot be denied that the diarrhœa is thereby aggravated, and that large coagulæ of undigested milk may sometimes be found in the stools. We must endeavor, by the aid of thick mucilaginous drinks, a thick decoction of salep-water, gum-water, rice-water, etc., to counteract the inevitable irritation from the lactic acid of the milk consumed. Children seriously ill of typhus require nothing else than cold water, and for days will refuse all other drinks, even milk and soups, and they do not become more emaciated than others who partake of nourishment several times a day. It is therefore very questionable whether the food administered to typhous children is generally assimilated. When collapse becomes very threatening, or in commencing splenization, and the pulse begins to sink, a tonic and stimulating diet is urgently called for.

In coffee we have a convenient and easily-procurable stimulating remedy, which, on account of its agreeable taste, is preferred to all other excitants, such as camphor, musk castoreum, ammoniacum, etc. With one cupful of strong, sweetened coffee, containing but little milk, the powers of the system will often revive, and the circulation receive new impetus. In addition, beef-broth with yolk of eggs must be tried, and may also be administered per anum. Camphor is very difficult to administer to children, and usually causes vomiting. Musk also behaves in the same way, besides communicating its disagreeable odor to the whole house. Cold affusions usually recall consciousness, invigorate the respiratory functions, and induce perspiration. If there be several unconscious discharges from the bowels daily, tepid baths of 98° F. should be employed, in which the children may be kept from five to ten minutes, or sufficiently long to thoroughly clean them. Miliary, roseola typhosa, and bronchitis, are not to be regarded as contraindicating these baths.

Now, if by the third or fourth week a lively appetite has set in, the utmost precaution will have to be exercised. Mucilaginous and beef soups, milk, coffee, and milk-broth, may be continued till complete constipation, freedom from fever, and a clean tongue, take place; then well-prepared chicken or veal may be tried. Fat nutriments and green vegetables should be avoided for a long time; indeed, it is best to defer giving them till the children are able to go about.

With this simple, expectant treatment, the majority of the cases will terminate favorably. Should any symptoms become especially threatening, they will, of course, have to be specially attended to.

The best remedy for the fever and congestion of the head is cold. The means by which this is accomplished are: cool temperature of the room, from 58 to 64° F., light coverings, hair cut short, pillow of horse-hair encased in soft deerskin, hourly cold douching of the head, cold affusions of the whole body, once or at most twice daily, and a bladder filled with ice to the head—this, however, is applicable only to large children when not delirious. I have never yet seen any benefit from sinapisms applied to the nape of the neck, the calves of the legs, or the feet. The redness and great sensitiveness of the skin, which last for several days, and which invariably result from those sinapisms, always excite sick children and make them still more restless. Blisters should never be applied to a typhous child. They heal very slowly at best, frequently become covered with a diphtheritic exudation, and even gangrenous.

The best remedy for the excitement, sleeplessness, and delirium, in this disease, is laudanum. One drop less than the number of years of the age of the child should be given; thus, to a child three years of age, two drops, to one four years, three drops, etc.; and this may be repeated twice or thrice daily. I have never yet seen any of the bad effects attributed to opium, such as collapse, profound sopor, depression of the pulse, cyanosis, etc., from this practice, but have always noticed that children obtained several hours' rest, refreshing alike to themselves and their attendants, without any untoward change in the course of the fever.

Against the great exhaustion, feeble pulse, cool, bluish skin, indicating supervening splenization of the posterior parts of the lungs, a tonic and stimulating treatment will have to be employed, in which I give to coffee the most prominent position; wine, which, in adults, justly plays such an important rôle, must be used very carefully in children, because alcoholic drinks affect some infantile brains very unfavorably, inducing furious delirium. Internally, it is best to give a few drops of valerian, camphor, or acetic ether. Nothing praiseworthy can be said of the tonic effects of quinine in these cases; dry cups, applied several times a day to the anterior and lateral parts of the thorax, are not only theoretically rational, but practically exercise a tolerably favorable influence upon the splenization.

Moderate epistaxis always brings about relief and rest. The nurses should be instructed to allow the blood to flow into an empty vessel, one that does not contain any water, because otherwise the amount of blood lost is usually estimated too high, and we might hasten to arrest the hæmorrhage, which usually ends quite soon enough. The tampon is indicated, as a rule, only when the amount of blood lost exceeds two or three ounces. It is generally sufficient to push a small piece of ice into the nasal cavity and then plug it with some charpie. It will scarcely ever be necessary to tampon the posterior nares by the aid of *Bellocque's* tube, an operation which annoys and frightens the child very much. To determine that the hæmorrhage has really been checked, the child, after the tampon has been applied, should be laid upon the face, or the head should be held forward a little, as, otherwise, the bleeding may continue, and the blood may flow backward and be swallowed.

Typhous diarrhœa cannot be completely arrested by any remedy; opium controls it a little; astringents and mucilaginous agents usually have no effect upon it. In general, however, the diarrhœal discharges in children are seldom as profuse and persistent as in adults.

Constipation is sometimes a disagreeable symptom in the course of typhus fever, occurring at certain times almost epidemically. It should never be relieved by purgatives, but only with clysters. If the latter have proved ineffectual, calomel is the only remedy which may be given internally, for the aqueous extract of rhubarb or castor-oil is difficult to administer to children. In conclusion, I feel it a duty to admonish against the use of all debilitating measures, to spare the strength of the child as much as possible under all circumstances, and to carefully avoid the practice of active antiphlogistic measures.

B. *Cholera Asiatica.*—The history, epidemic character, manner of propagation, and etiology of epidemic cholera, have of late been so thoroughly investigated, that we may very properly omit them altogether here, especially since cholera Asiatica in children has manifested no peculiarities. But the symptoms which attend it in children differ materially from those manifested in the adult, and it is this difference only which we will here consider.

Since diarrhœa in general is extraordinarily frequent in small children, and is constantly reproduced by the irritation of improper food or dentition, it is therefore still more difficult to decide in them than in adults whether a diarrhœa originating during the prevalence of an epidemic of cholera is to be attributed to cholera-poison or to the above-mentioned ordinary causations. It is certain that, during an epidemic, all children, even nurslings, are more predisposed to diarrhœa, and that it is more difficult to arrest it, than during periods free from epidemic influence. Diarrhœa thus induced may either continue as such for a long time, and be arrested after many weeks, without any additional serious symptoms having become superadded, or it may pass into real cholera. In many cases, however, no diarrhœa at all precedes, and very healthy children are suddenly attacked by profuse purging and vomiting, and in a few hours display the most perfectly-developed cholera, with profuse bright-yellow discharges, cramps, disappearance of the pulse, algor, cyanosis, and suppression of urine. The discharges are seldomer of the rice-water character than in adults.

Two stages may also be distinguished in children: (1.) The stage of the attack, and, (2.) The stage of reaction. Few children, however, reach this stage, most of them perishing during the attack. The secondary processes and the exhausted condition belong to the phenomena of reaction. In general, however, three principal classes of phenomena may be distinguished in cholera: (1.) Those belonging to the intestines; (2.) Those of the circulation and respiration; and (3.) Those of the kidneys.

(1.) By far the most important are the derangements of the intestinal mucous membrane; they are invariably the first to appear, and probably are the causation of the alterations of the circulation, and very certainly of those of the kidneys.

It is a remarkable circumstance that the stools of children seldom become as white as those of the adult, but almost always retain a yellowish tint; in other respects, they present neither chemical nor microscopical modifications worthy of note. They are rarely very copious, but five to six thin evacuations in an infant suffice to induce the most dangerous collapse. In previously marasmic children, collapse may supervene even after the first thin passage, followed by a few convulsions, and in a few hours by death. When the stools become pink red, a coloring due to a small admixture of blood, the prognosis may be set down as absolutely hopeless.

No child under one year of age is able to resist a profuse cholera purge longer than forty-eight or at the utmost sixty hours, death taking place in consequence of the enormous loss of the fluids of the body. But when the discharges are seen to grow less and more infrequent, then more yellowish, more solid, and assume an intense but not an actually fetid odor, a favorable prognosis may be given.

As respects the vomiting in the cholera of children, there is a marked difference from the adult. In the latter, it is observed in nine-tenths of the cases, in the majority of cholera children not at all, or at the most once or twice, and the profuse vomiting of every thing shortly after it has been introduced into the stomach scarcely ever occurs in such children, a fact that is the more remarkable, as children in health vomit oftener and easier than adults. The act of vomiting is accomplished by a very slight exertion only: the food last taken is first thrown up, and soon followed by the real transudation from the gastric mucous membrane, generally mixed with the drinks, which, on account of the tormenting thirst, are constantly swallowed in large quantities. In regard to the chemical properties of the matter vomited by cholera children, but little, so far as I am aware, is known, because it is always ejected on to the garments or bed, and cannot therefore be obtained in sufficient quantity for proper chemical examination.

The absorbing function of the gastric and intestinal mucous membrane is very much diminished during the attack, and for that reason large quantities of toxic substances, such as morphine, strychnine, belladonna, etc., may be administered without producing their normal effect; sometimes, however, when the transudation already happens to be undergoing spontaneous diminution, dangerous absorption suddenly takes place, and attention on this account is here called to that point. As this class of remedies is repeatedly selected for new therapeutic experiments, it is well for the experimenter to know that, deceived by the first dose, appearing to be inert, he may suddenly find it to have produced a poisoning, and to have destroyed the last hope of the recovering child.

Soon after the commencement of cholera, the abdomen quickly collapses, and becomes so soft and flabby that the intestinal coils may be recognized. Percussion shows that the stomach contains a tolerably large quantity of gas, while the whole intestinal tube is filled with transudation, and therefore a perfectly dull sound is produced. The patients seem to suffer less from true colic than from a feeling of incessant nausea, which they manifest by frequently opening the mouth, protruding the tongue in a peculiar manner, and an anxious expression of the countenance.

It is a remarkable fact, that the most profuse diarrhœas of cholera Asiatica do not redden the anus, while, on the contrary, in enteritis folliculosa, or the effects of thrush, it becomes red and eroded after a few evacuations.

The next effect of this transudation, and the complete abolition of the function of absorption, is, naturally, a marked diminution of the whole volume of the blood, and a disappearance of the fluids from the parenchymatous organs and serous sacs. Whether all subsequent symptoms are induced by this diminution of the blood and fluids, or whether the poison of cholera produces a specific action, in some other place besides the intestinal canal, are still undecided questions. The course is so extremely rapid in children, that a direct action of the cholera-poison upon the heart and pulse seems probable, as sometimes the pulse and the diastolic sound of the heart disappear almost with the first liquid passage.

(2.) During the first few hours of the cholera attack, the *circulation* is said to be increased in activity, accompanied by violent palpitation of the heart, and intense beating of the arteries; usually, however, the impulse of the heart, and of the radial pulse, become weaker hourly from the very commencement, and the latter soon disappears altogether, while the cardiac sound continues to grow weaker and duller, till the diastole alone is heard over the large vessels, even after it is imperceptible over the apex itself.

The pulse, in children under one year old, retains its normal frequency; generally it is about 100 in the minute; soon, however, it becomes thready, and then disappears altogether. The observations which *J. Meyer* made in the adult—to the effect that the pulse, in cases of spontaneous reaction, remains absent for a long time, but after it has once returned does not readily disappear again; and that, on the other hand, in cases where reaction was induced artificially by stimulants, the pulse acts reversedly—are equally true of cholera of children. Very frequently it is possible, by a high temperature, a mustard-bath, or a camphor-powder, to restore the pulse, it is, however, very seldom possible to preserve it; it soon disappears again, never to return. On the whole, it may be observed that pulseless children, when this state has existed for several hours, are generally lost, while there are many instances recorded of adults who have been pulseless for from twelve to twenty-four hours, and even longer, and have nevertheless recovered. In cholera typhoid, various anomalies of the pulse, such as intermittent and extremely-rapid pulses, occur; a very slow pulse, even forty to fifty in the minute, the like of which is only met with in hydrocephalic children, is not a symptom inconsistent with a favorable prognosis.

The veins are turgid with semi-fluid, grumous blood, on account of the tardy venous circulation, resulting in part from enfeebled ***vis a tergo***, and in part also from the suction-power of the right side of the heart having become enfeebled. This stasis of the capillaries is seen in the lips, fingers, and eyelids, as cyanosis. In cholera, well-nourished children only become cyanotic, while emaciated and marasmatic children acquire only a correspondingly yellowish-gray discoloration.

The *respiration* during such sudden and profound disturbances of the circulation very naturally becomes affected. By physical examination, nothing abnormal can be detected in the lungs, but, in the performance of the respiratory act, changes are soon observed. The child breathes irregularly, frequently sighs deeply, and suffers intense dyspnœa. But the most remarkable phenomenon of all, is the coolness of the breath, which may be distinctly perceived by holding the hand, especially its dorsal surface, over the mouth. Prognostically this coolness of the breath is of the greatest importance, and is palpably the most distinctive sign of the arrest of the metamorphosis of the tissues. With this, the coolness of the extremities always stands in direct relation. Palpation of the nose, forehead, hands and feet, as well as the temperature of the expired breath, with a warm hand, will be sufficient to enable the experienced physician to form an opinion as to the severity of the disease, and its probable termination.

(3.) The morbid changes of the kidneys are as constant in children as in adults. The autopsy discloses the signs of stasis and acute Bright's disease. It is, however, impossible in most cases to discover these facts by an examination of the urine during life, because the patients either do not pass any urine at all, or it dribbles away from them into the diaper, and cannot be obtained for examination. When children recover from a severe attack of cholera, as they occasionally do, albuminuria and casts will be found. How long the secretion of urine may be arrested, and yet recovery follow, it is difficult to say, for the diapers are incessantly wetted with the profuse stools, so that an admixture of urine cannot easily be recognized.

In consequence of the arrest of the secretion of urine, a violent revolution in the entire metamorphosis of the tissues very naturally ensues, and the retention of the urates must be regarded as the main effect of this condition. The tonic and clonic spasms, at least of the face, by which all cholera children are attacked, are most probably attributable to it, while the great exhaustion, the rapid collapse, and the aphonia, are due more to the speedy loss of the serum than to any other cause.

When children recover from an attack of cholera, the first urine passed contains albumen, and is rendered opaque by the urates; a cholera typhoid then develops itself, in which the skin becomes hot and dry, the pulse hard and extremely frequent, the tongue inclined to dryness, and the symptoms of cerebral congestion come on. In many cases, however, death is caused by convulsions, while in others marasmus develops itself, from which but few children escape with their lives.

If we subject the symptoms of cholera in children to a *résumé*, we find the following variations from those of the adult:

(1.) The stools remain yellow for a long time. (2.) Collapse comes on very rapidly in feeble, atrophic children, and death ensues before many colliquative stools have passed. (3.) Vomiting is rare, and in many instances absent altogether. (4.) The comparative mortality is much greater; at least eighty per cent., of the children who become cool and pulseless, perish.

The pathological anatomy, which in cholera is generally very meagre, exhibits nothing peculiar in children. In those who succumbed early in the attack, the following conditions are found, viz.: a peculiar tenacity of the serous membranes, dryness of all the parenchymatous organs, cyanosis of the skin, black masses of grumous blood in the veins and heart, the small intestines filled with a whitish fluid, their mucous membranes a rosy tint and completely denuded of epithelium, the kidneys infiltrated, the urinary tubules revealing extensive desquamative catarrh, and the bladder empty.

If, on the contrary, they died from cholera typhoid, the cyanosis of the skin is less marked, the serous membranes are still glutinous, the brain is œdematous, lobular infarctions are frequently found in the lungs, the small intestines contain a thick, tenacious, greenish mucus, their mucous membranes are less infiltrated and injected, and the solitary glands of the large intestines are swollen or ulcerated. The bladder now contains a little opaque urine, in which generally albumen may be detected.

Treatment.—The therapeutics of cholera in children, as may be inferred from the relative mortality, is extremely unsatisfactory, though the most important part of the treatment, the artificial maintenance of the temperature, is more easily effected than in adults. The general discussion of its prophylaxis may be properly omitted here, as this has lately been very minutely described in various text-books, for example, in *Griesinger's* Infecting Diseases. The treatment of cholera diarrhœa, and of cholera in children, differs but little from that practised in the adult. The attempts to check the purging in any manner, as soon as the stools have become watery, bright yellow, or, still worse, rice-water-like, prove totally fruitless. For simple diarrhœa of teething, which, during the prevalence of an epidemic of cholera, must always excite the greatest anxiety, laudanum will always prove the most reliable remedy; but, if true cholera come on, no benefit what ever, according to my experience, need be expected from it. The tincture of opium may be given in from four to five times the usual doses. Should the diarrhœa, however, continue unchanged, as it often does, or if it have existed for one or two days before the narcotic was administered, it may suddenly be arrested, and be followed by the most violent signs of narcotism. Astringents, and especially all those remedies to which any constipating effect has been ascribed, are useless.

It should be borne in mind that, in consequence of the profuse exosmotic current, which takes place toward the mucous membrane of the stomach and intestinal canal, no absorption whatever probably occurs. In the next epidemic, therefore, I intend to select some other places, which seem to be more disposed to absorption, for example, the bladder, urethra, and vagina, and try different remedies, especially of the class of narcotics. Injections into the veins are very difficult to perform, owing to the smallness of the vessels in children, and this practice will hardly ever be successful, on account of the danger of admitting air into them.

As regards the diet and regimen, it should be clearly stated that the proscribing of drinks, by which it is intended to check the profuse diarrhœa, is totally useless and cruel. Children certainly ought not to be allowed too much at one time, but they may drink as often as they feel thirsty. Large quantities of fluids, when swallowed rapidly, are liable usually to cause vomiting. Children prefer cold water to every thing else, and the nursling will draw actively at the mother's breast as long as its strength will allow; and, when it has become too feeble, will swallow the milk taken from the breast of the mother with avidity. An administration of other nutriment, except plain demulcents or lukewarm milk, is, of course, altogether out of the question; warm chamomile and peppermint teas are rejected by most.

The principal indication is, manifestly, an artificial continuous warming of the chilled surface of the body, which is best accomplished by placing the child in a hot-water bath of 30° R. (100° F.), in which one or two ounces of ground mustard are suspended. The skin thus reddened should be dried quickly, the child then put to bed, and surrounded by bottles filled with hot water, and the diapers should not be changed oftener than once in two hours. By keeping up a high temperature, the pulse that has totally disappeared sometimes becomes again perceptible, the diarrhœa diminishes, the tip of the nose, the ears, and the breath, become warm, and a reaction sets in, which, even then, very frequently indeed, terminates in a fatal typhoid condition.

The most important indication in the typhoid condition is the frequent administration of drinks, in order to restore the occluded passages in the kidneys, and render them again permeable. The nervines, such as camphor, musk, coffee, etc., and the so-highly-lauded quinine, seem to me to have no favorable effect upon the course of this disease. During convalescence, the utmost caution will have to be exercised so long as any abnormal changes whatever can be detected in the stools. Children at the breast should retain their wet-nurses from six to eight weeks after the attack of cholera, and should be weaned very gradually; those brought up by hand should be fed upon mucilaginous soups for a long time, and slowly habituated to a milk-diet.

Consoling and important as the prompt and efficient services of the physician may be regarded, it is problematical whether all his therapeutic measures are of the slightest use to the child with cholera.

(16.) ENTOZOÆ, ENTHELMINTHES, HELMINTHIASIS (WORM-DISEASE).—Before we enter upon the discussion of the effect of the single helminthia, it seems proper to give the subject a simple zootomic consideration, for which purpose we take, as a part of our ground-work, *Bamberger's* excellent monograph upon entozoæ, found in his treatise on the diseases of the abdomen. In the alimentary canal of children there are found: (1.) Tænia solium; (2.) Bothriocephalus latus; (3.) Ascaris lumbricoides; (4.) Oxyuris vermicularis; and, (5.) perhaps, also Tricocephalus dispar. Trichinæ, which of late have attracted so much attention, may occur in older children as well as in adults. Small children, so far as I am aware, enjoy a total exemption from the trichina spiralis. This is readily accounted for by the fact that they do not eat the meat of the hog, which is known to be a fruitful source of supply of this entozoon. Since trichinosis of children differs in no respect from that of the adult, a description of it may, therefore, be omitted, as the numerous monographs upon this subject have obtained the most extensive circulation and study, and are accessible to every reader.

(1.) Tæniæ solium, and (2.) Bothriocephalus latus. (Cestodiæ.)

Tænia solium (T. cucurbitina, armata, chain-worm), Pl. IV., Figs. 4–7, is a yellowish white, tape-like, jointed worm, fifteen to thirty feet in length, and three to five lines in breadth. Like all Tænia, it has the male and female sexual organs united in each of its developed joints, and propagates itself by eggs, which, however, never attain to maturity in the alimentary canal itself. The head, to the naked eye, appears as a white point, on which, with a No. 4 magnifying glass, blackish pigmented suckers may sometimes be detected. Between these is the conical proboscis surrounded by a double circle of hooks, but the individual hooks are so small, that a magnifying power of two hundred is required to see them distinctly. The neck is several inches in length, not jointed, resembles a flattened thread, and gradually merges into the body, which, as already stated, is jointed. The first joints have a greater transverse diameter, which becomes gradually less posteriorly, till toward the end they are square or parallelogram in shape, with blunt corners. On the latter the genitals are distinctly seen, for a projection is found on their borders with the orifices for the vagina and penis, and the ovary is seen through their translucent walls. This projection is generally situated alternate on the borders of the joints.

New joints constantly form at the head, while at the tail the old joints are constantly cast off. These cast-off segments or joints appear in the stools, and are frequently compared to pumpkin-seeds in appearance, and thus the definition of *tænia cucurbitina* has originated.

(2.) Bothriocephalus latus (Pl. IV., Figs. 1–3, tænia lata, the broad tape-worm) is very similar to the preceding, but is distinguished from it by the following peculiarities: It is of a darker grayish color, the head oblong, with longitudinal depressions, without snout and without the rows of hooks. The neck is much shorter; all the joints are broader than they are long, and overlap each other in the form of slates upon a roof; and the most characteristic feature observable on every joint is, that the sexual orifices are *not on the border, but in the centre of* the joints.

The eggs are of a brownish color, and glisten through the central portion of the translucent walls of every joint like yellowish-brown rosettes. The bothriocephalus has, in addition, the peculiarity of not readily casting off single mature joints, but always whole rows of joints, and this materially aids us in forming the diagnosis, since we have to rely upon the history of the patient almost entirely.

These two kinds of worms display a remarkably reciprocal exclusion. Thus the bothriocephalus occurs only in Russia, Poland, and Eastern Prussia, as far as the Weichsel, while tænia solium is seen in all the rest of the countries of Europe, except Switzerland, where, according to Mayer-Ahrens, they are both observed.

They are extremely rarely found in children under one year of age, in nurslings probably never. Tænia solium, according to *Küchenmeister's* investigations, originates from cysticercus cellulosa of the pig, and therefore occurs only in children who partake of hog's meat.

(3.) *Ascaris lumbricoides* (Class of Nematodiæ), round-worm.

The round-worm, Pl. IV., Figs. 8 and 9, is a round, yellowish, or reddish worm resembling the earth-worm, of five to ten inches in length, and one to three lines in thickness. It is very slightly flattened, has a mouth and an alimentary canal; the head is distinguished from the body by a constricted point, and is composed of three papillæ, which, during the act of sucking, are capable of dilating themselves into a broad suction-cup. The male and female can be easily distinguished; the male is smaller than the female, and has a curved tail, and occasionally a couple of very fine small white hairs are seen close to the end of the tail, indicating the position of the penis. According to *Küchenmeister*, if the body of the female be pressed, a thin bag (the ovaries) is squeezed out from the vaginal opening, which is located in the anterior half of the animal, attended by an effusion of a milk-like substance (the eggs). If the male worm be squeezed, a milky juice (semen) flows out from near the anus, without any rupture or prolapsus taking place. The skin, according to *Czermak*, consists of six layers, and is formed of tape-like transverse rings which are not endless, but sometimes split dichotomously, and usually terminates at the lateral lines of the animal.

The round-worm inhabits, by preference, the small intestines; is seldom found solitary, but in numbers of from five to ten, and sometimes as many as two or three hundred. It is much more frequently met with in the alimentary canal of children than in that of adults. It does not occur in nurslings, but may in small children who are brought up by hand on meal-jam or toast-broth. The eggs of this worm are undoubtedly introduced into the alimentary canal with the food; at least no other supposition can be assumed, since, according to *V. Siebold*, the female ascarides never bring forth any living young, nor is the spawn ever found in the human intestines. They seem to prefer amylaceous nutriments, but it does not follow from this fact that all children who readily eat bread harbor ascarides. Were it otherwise, there would certainly be no child that did not suffer from them.

(4.) Oxyuris vermicularis (Ascaris vermicularis, spring-worm, intestinal moth, maggot-worm). Class of Nematodiæ, Pl. IV. Figs. 10–13.

The name oxyuris is only applicable to the female, not to the male worm. The female is thin, yellowish white, of from two to five lines in length, with a straight, awl-like, pointed tail. The male is barely a line in length, and has a strongly-curved tail. Both have a bulbous head, with two lateral, bladder-like membranes. The female is found in vastly greater numbers than the male, and the latter is *never found in the stools*, because it adheres very firmly to the intestinal mucous membrane, from which, according to *Zenker*, it may very readily be scraped off with the mucus after death. The male worm is still more easily collected when the alvine secretions of the large intestines have been washed away by diarrhœa. The usual abode of the oxyuris is in the rectum. In the large intestines it is found in small numbers only, and scarcely, if ever, in the small intestines. It travels from the rectum, especially when the children lie in warm beds, and wanders to the vagina in girls. *Küchenmeister* says it is a "superstition" to regard them as only or chiefly peculiar to childhood, and affirms that he has observed them twice in the adult. But every experienced physician, who practises in a region where oxyuris is at all common, will be able to offset those two adult cases by as many hundreds of cases of children, and hence I see no good reason at all for rejecting this "superstition."

(5.) Trichocephalus dispar (Nematodiæ). Whip-worm. Pl. IV., Figs. 14 and 15.

The trichocephalus is a white, long worm, of from one to two inches in length, as thin as a hair at the head, and very gradually grows thicker posteriorly, presenting a strong resemblance to a whip-stalk. At the tip of the thin extremity an unarmed mouth is found, in which the œsophagus terminates. In the female the posterior part is straight, and exhibits a simple, straight vagina, but in the male it is spirally twisted; the end is provided with a small prepuce and a penis.

This worm is found almost exclusively in the cæcum and ascending colon, and is very seldom seen in the fæces, because, as it seems, it very unwillingly leaves the gut. Once, while making a *post-mortem* examination of the body of a girl fifteen years old, who died of cholera on the fourth day, after the most profuse diarrhœa, I found at least thirty of these animals in the cæcum, and all the physicians present at the examination expressed their surprise at the animals having remained in the bowels for four days with such liquid and profuse evacuations. It is very rarely met with in children, and in fact has only been described for the sake of completeness.

Symptoms.—In regard to the symptoms which are occasioned by the entozoæ, much has already been written and disputed. Our predecessors undoubtedly attributed too great an importance to intestinal worms, and believed that many serious diseases were caused by them, for no other reason than that, during such disease, these worms passed off and then restoration to health followed. The symptoms attributed to them became more and more numerous and variable, and finally so confused and improbable, that intelligent physicians began to deny the existence of worm-symptoms, as many do even at the present day, especially the Viennese physicians. Like every thing else that is new, this negation found many adherents, and for some time it was very fashionable for one not to know any thing about the anthelminthiæ. Some symptoms, however, cannot be ignored, and, in order to proceed safely, I will only mention those which I myself have observed many times. They may be divided into local, general, and reflex symptoms; the imaginary symptoms which in adult tape-worm patients occur so frequently, we may in the Pædiatria, fortunately, ignore altogether.

A. *Local Symptoms.*—Of the local symptoms, those which arise from the direct irritation of the entozoæ are first of all to be mentioned. Pain is a very frequent symptom; sometimes it is pinching, gnawing, boring, etc., and is uniformly intermittent. Various articles of food, especially those which are very salty, or aromatic, or sour, increase it, and consequently all kinds of fruit aggravate it, while milk, oleaginous and fatty nutriments, generally mitigate it. The appetite in worm-patients is usually normal, sometimes, however, diminished; it is not easy to decide in children whether it is increased by worms, because it is well known that at different times an abnormal augmentation of the appetite occurs in every child. Generally the cause of an augmentation of the appetite is to be sought in a more rapid development or more active exercise, and bodily exertion, and not in the existence of worms. Vomiting may become superadded, either as the effect of the entrance of a worm into the stomach, or as a reflex phenomenon, having its source in the irritated mucous membrane. Ascaris lumbricoides frequently find their way into the stomach, where by their movements they seem to induce retching and vomiting, by which, to the great horror of the parents, they are sometimes thrown up. The youngest child that I saw throw up a round-worm was nine months old, and had merely partaken of a little meal-broth, along with the milk of the mother, for only three months. The stools are generally irregular; sometimes there is constipation, and sometimes diarrhœa is present; with the latter, as a rule, a great number of the entozoæ are expelled. The large masses of mucus (so-called worm-nests), which occasionally pass off from tape-worm patients, are seldom observed in children, because tape-worm is rare in children.

In girls, oxyuris sometimes travel from the rectum, where they occasion incessant itching, into the vagina, redden its mucous membrane, and give rise to leucorrhœa. The incessant tickling sensation they produce is often the stepping-stone to onanism, of which practice it is seldom possible to break them, even though the oxyuris have long been expelled. In boys they sometimes crawl up under the prepuce, from which balanitis, erections, and similar inclinations to onanism, may likewise be developed.

The round-worms extend their wanderings even farther than the oxyuris. They sometimes get into the œsophagus, causing vomiting, thence into the mouth and nose, and are even said to have passed into the larynx and produced suffocative attacks. In some *post-mortem* examinations, abscesses of the liver have also been found, in which one or two round-worms were hidden. These have doubtless found their way into the gall-ducts through the ductus choledochus, and then caused inflammation, hepatic abscesses, and death; they have been also found in the ductus pancreaticus and appendix vermiformis, where they produced irritation and suppuration. The extremely rare instances in which encysted ascarides were found in the peritoneal sac have lately been doubted altogether, because no organ can be detected on any part of the body of the worm by which it would be able to perforate the intestines. I have not seen such a case, and am therefore unable to decide; but *V. Siebold*, one of the most eminent helminthologists, and known for his conscientious observations, maintains that the ascarides are able to insinuate themselves, with their firmer cephalic extremity, through the coats of the intestines, and penetrate into the abdominal cavity, without it subsequently being possible to detect any trace of the perforation of the bowel. The penetration of the muscular coat is indeed possible, but how the compact mucous membrane and the dense serous coats are made to give way before so mild a pressure as the round-worm is capable of exercising, is really difficult to imagine.

B. *General and Reflex Phenomena.*—Itching of the nose is a very common symptom of the presence of worms; still, it should not be forgotten that almost all children bore and rub their nostrils and nose, whether they have worms or not, so that this symptom has no great value. I have often seen dilatation of the pupils disappear with the expulsion of ascarides, and I consider it, though not a very constant symptom, one sufficient to merit regard. Convulsions of various kinds, especially epilepsy and chorea, have been looked upon as being connected with entozoæ. As these views are also entertained by the laity, I have in many instances been requested to treat such children for worms, but have been unable to detect any entozoæ, or any change in the convulsions, notwithstanding the employment of the most energetic remedies. The occurrence of worms in choreic and epileptic patients seems, therefore, to be a mere coincidence.

I doubted, until I finally convinced myself of it, whether worms can produce severe hydrocephalic symptoms. Some years ago a child was brought to our children's hospital in a dying condition, having been first attacked by convulsion a few days before. It presented all the signs of a child dying from acute hydrocephalus, and died in a few hours.

To our great surprise, at the autopsy we found the brain and its meninges, the heart and lungs, the liver, spleen, and kidneys, in a perfectly normal state, but in the intestinal canal there were more than a hundred round-worms, rolled up in small and large balls, at some points completely choking up the calibre of the canal; the mucous membrane itself in the same regions had become reddened.*

Diagnosis.—By these local and general symptoms a probable diagnosis may, it is true, be arrived at; a certain one, however, is only derived from the appearance of helminthiæ in the evacuations, or, in the case of tape-worm, the appearance of single pieces. Since the ordinary vermifuge remedies are harmless when given to children free from intestinal catarrh or other disease, we are justified in administering them to children presenting the symptoms just described, in the hope that the expulsion of worms may confirm the diagnosis.

Treatment.—(1.) The expulsion of *tape-worm* may be undertaken in children of one year and over, providing they are free from diarrhœa, and otherwise healthy. Very young or teething children tolerate badly even the mildest tape-worm remedies. The simplest and surest remedy is *cortex radic. punicæ granati.* The precaution, however, should be taken to have it fresh and sufficiently macerated. For children of from two to five years, the following formula will be found useful: ℞. *cort. rad. punic. granat. rec.* ℥ j, macera c. aqua fontan. libr. j, per horas 24 dein coq. per hor. 12 ad remanent. ℥ vj. Two ounces to be given at half-hour intervals in the morning, fasting, the bowels having been gently moved the preceding day by the use of boiled dry prunes. It is advisable to have a double quantity of the granat-bark decoction prepared, because occasionally one or the other portion is thrown up, and in that case should be repeated in half an hour. After one or two hours, the whole worm is usually expelled. If this do not take place, or if the head of the tape-worm cannot be found in the stools, the same procedure may be repeated after a few days, without any detriment to the health. Generally no persistent diarrhœa nor colics are produced by this remedy, but, when they do occur, they may soon be relieved by emulsions.

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* That the reflex symptoms are sometimes of the most peculiar and variable kind is seen from the two following singular cases, which lately occurred to me. In the first, a girl three and a half years old, they manifested themselves by a croupous cough, differing in no respect from that occurring in genuine croup; in the second, a boy five years old, by severe and protracted toothache of almost all the teeth of the upper jaw, though, on examination, they were all found to be perfectly sound. In the former, the cough had a periodic character, i. e., it would come on whenever the oxyuris accumulated in any considerable numbers in the rectum, and would disappear as soon as these were expelled; in the latter, the toothache persisted until a long round-worm was expelled, since which the boy has been free from it.—Tr.

Where the fresh bark of granat-root is not obtainable, or if the child cannot be induced to take it, other remedies may be resorted to. Among these we may mention: *Ext. felic. mar. æther* ℈ss, the blossoms of Brayera anthelminthica, of which an ounce may be given, mixed with honey into a confection. Drastic purgatives, such as *gummi gutti*, *colocynth*, and *croton-oil*, should under no circumstances be given. In sickly children this treatment for tape-worm should never be practised. I am conversant with cases in which, notwithstanding the presence of the tape-worm, children have gradually recovered their health, the worm not seriously influencing development.

(2.) Ascaris lumbricoides seldom produce any serious disturbance or characteristic symptoms, and often pass off in large quantities from perfectly healthy children, in which neither any subjective nor objective symptoms preceded. The usual method of expelling them consists in active purgation with the following substances, viz.: *pulv. semin. cinæ* ʒ j, and *pulv. rad. jalap.* ℥ ss, divided into four or five powders, which are to be taken at intervals of two hours. It is easier, as a rule, to administer these powders mixed with a little water, than when made into a confection with honey. Owing to the alkaloids having come into such general use of late, it is customary to employ the essential principles of remedies instead of the gross substance, as they possess all the virtues in much smaller bulk. Hence a few grains of santonine are now given in place of a drachm of cinæ-seed. But the effect of santonine is by no means as brilliant as has been claimed by some; on the contrary, it is very problematical and much inferior to the ordinary cinæ-powder. Although the fear of calomel, with which some individual therapeutists are affected, is by no means well grounded, its employment as an anthelmintic has no defence. Children are liable to crush the wafer in which the powder is enveloped, in the mouth, and then generally get stomacace from it. In all the text-books on the diseases of children, *ol. ricini* plays a manifold part, and some physicians omit no opportunity to make the children happy by prescribing a few teaspoonfuls of castor-oil. I have frequently tried to administer it, but have succeeded in but few cases, as most children refuse to swallow it and spit it out. I have therefore discarded it altogether.

(3.) Against *oxyuris vermicularis* internal remedies are of but little use; on the other hand, it is very easy to remove them by clysters, since they are almost wholly located in the rectum. Various vermifuge remedies, such as decoctions of *garlic*, *onions*, *asafœtida*, *valeriana*, *tanacetum*, or a few drops of *turpentine*, *camphor*, salt water, and even a weak solution of corrosive sublimate, may be added to the clysters. The principal object, however, is always to soften the contents of the rectum, and to cause their expulsion once a day. This is easily accomplished with simple cold-water. Two cold-water clysters daily, continued for four weeks, will invariably expel all oxyures. If leucorrhœa at the same time be present, cold-water injections will be found equally efficacious for that. In the large liquid evacuations which follow the first cold-water clysters, such a countless number of oxyures is sometimes found, that the liquid fæces are kept in a constant state of agitation by the swarm of animals.

(4.) Trichocephalus dispar never produce any symptoms, and are scarcely ever seen in the evacuations, but always observed accidentally at the autopsy; a description of the method of expelling them is therefore impossible and unnecessary.

E.—*LIVER.*

The liver is comparatively much larger in the new-born child than the yearling. *Frerichs*, however, is unable to confirm the assertions of *Portal* and *Meckel*, according to whom the liver should be one-fourth heavier in the new-born child than at eight to ten months. That author found that the weight of the liver in comparison to the whole body is

As 1: 17 in a seven months' fœtus,
" 1: 28 in a new-born child,
" 1: 24 " " " " "
" 1: 20 " " " " "
" 1: 33 in a child sixteen months old.

The average weight of the liver of a new-born child is 100 grammes, but that of a child one and three-quarter years old is 250 grammes, so that any actual decrease of the structure of this organ is altogether out of the question.

The physical examination of the liver in children is conducted very much upon the same principle as in the adult. It is first percussed in the axillary line (a perpendicular line drawn from the axillary cavity downward), then in the mammillary line (a perpendicular one drawn from the nipple downward), and finally in the sternal line (a perpendicular one from the sternum outward). By the first two lines, the diameter of the right lobe, by the last, that of the left lobe, of the liver is ascertained.

This percussion is rendered very difficult by the restlessness of small children, and, in the examination of the position of the liver, allowance must especially be made for the very important influence of the respiratory acts. Older children, from the third year upward, may, by friendly coaxing, be induced to allow themselves to be examined as quietly as adults.

Diseases of the liver are extremely rare in young children. As we have already described icterus neonatorum in the chapter on the diseases originating directly after the delivery, there remain only the syphilitic and fatty livers, and the congenital anomalies of the liver, to speak of. The other hepatic diseases, cirrhosis, carcinoma, and echinococcus, are very seldom met with in children, and, when they do occur, their symptoms differ in no respect from those of the adult. Acute hepatic atrophy, so far as I am aware, has never been observed in children.

(1.) SYPHILITIC INFLAMMATION OF THE LIVER.—*Rayer* and *Ricord* were the first who pointed out the connection between a peculiar morbid alteration of the liver and secondary syphilis, but *Dittrich* established it satisfactorily by a number of more accurate investigations. In general, however, the disease is very rare. I have dissected many children with hereditary syphilis (perhaps fifteen), and always carefully examined the liver, but only once found this morbid condition.

Pathological Anatomy.—At the autopsy of children with congenital syphilis, almost all of whom, as is well known, perish, a peculiar kind of inflammation, which attacks the glandular substance of the liver, is sometimes found. The exudation of this inflammatory process is partly plastic, and at a later period becomes transformed into cicatricial tissue. It, however, rarely reaches this condition in children, for death usually ensues too early. This exudation is composed of sero-plastic material, and therefore absorbable, and of a grayish or yellowish mass, which exhibits, microscopically, elementary granules, oil-globules, and only a few liver-cells. This yellowish-gray material, when the process has lasted long enough, is found in masses of the size of a hemp-seed, or of a pea, and circumscribed by the plastic substance, which subsequently becomes cicatricial. When these morbid changes occur at many points of the liver, it thereby acquires an uneven, roughened appearance, and the peritoneal covering, if the morbid alteration takes place on its superficial surface, becomes indurated and callous. The free spaces of the liver in children, as a rule, are normal; in adults, cirrhosis, carcinoma, and nutmeg or fatty liver, may occur along with the affection under consideration.

In young children, the form of the liver is rarely changed by this disease; usually nothing is found but a few spots, which, on section, prove to be firmer than the normal tissues, have a pale color, and are composed of granules, oil-globules, and only a few liver-cells.

Symptoms and Therapeutics.—The special symptoms belonging to liver-disease are slightly marked and difficult to recognize. These unfortunate children, who usually are two or three months old, bear upon them the signs of hereditary syphilis, such as condylomatous excrescences around the anus and at the angles of the mouth, ulcers about the mouth, ozœna and a syphilitic exanthema. The nutrition is very imperfect, and the emaciation extreme. The upper surface of the liver may possibly be found irregular or nodular, and its free border in some places slightly thickened and more rounded than in health.

The minor alterations of the liver are, of course, totally indistinguishable, and cannot be diagnosticated. As a complication, we may mention fibrous degeneration of the kidney, followed by anasarca. The most remarkable feature about this disease of the liver is, that icterus never occurs with it, but a grayish earthy hue of the skin supervenes on approaching dissolution.

No special treatment can be recommended for this condition. All those children who are not fed at the breast of their own mothers, and, on account of their liability to inoculate any other woman, cannot get a wet-nurse, almost invariably perish, no matter whether their livers are affected at the same time or not. The inunction treatment, where the state of the skin allows it, offers the best means thus far known for a recovery. This subject will be found more fully treated under *Therapeutics of Syphilis.*

(2.) THE FATTY LIVER (*Hepar Adiposum*).—By fatty liver we understand a greater quantity of fat in the hepatic cells than is normally present, and always in such amount that distinct alterations of color of the parenchyma take place. This change of color is an important feature, because, if observed and regarded, we avoid the error of supposing that a few liver-cells containing oil, such as may be found in every *post-mortem* examination, must be considered fatty degeneration. In the infantile organism, fatty liver is a tolerably frequent accompaniment of consumptive diseases, especially of pulmonary tuberculosis and of protracted intestinal catarrh.

An attempt has been made to explain its origin in tuberculosis in various ways, and most authors are inclined to the view that in this instance it is produced by the embarrassed respiration, in consequence of which the oxidation of the hydro-carbons and fat cannot properly progress. But *Frerichs* very correctly observes that very many more decided disturbances of the respiration, pulmonary emphysema, for instance, do not induce fatty livers, and that, on the other hand, in other tuberculous diseases, such as tuberculosis of the bones, in which the lungs may be totally unimpaired, the fatty liver may also be found present.

He believes, therefore, that here the cause must be sought in the *altered state of the blood* that supervenes during the process of emaciation, and which consists in its becoming overloaded with fat, which in the progressive emaciation is absorbed. Hence the fatty liver is more marked in pulmonary tuberculosis than in other consumptive diseases, because in unimpaired lungs a greater consumption of oxygen takes place, and consequently a more rapid transposition of the excess of fat in the blood is effected.

Pathological Anatomy.—A well-marked fatty liver has a larger surface than the normal organ, is flattened, and its margins are thickened and rounded. Its upper surface is smooth, glistening, whitened, and has a doughy feel; the pressure of the finger leaves an impress. In color it is yellowish red or pale yellow, and a dry, slightly-warmed blade of a knife becomes coated with fat when drawn through its substance. The quantity of fat, as ascertained by analysis, is very considerable. In one case *Frerichs* found 78 per cent. in the dried substance of the liver; in the fresh state, the same liver contained 43.84 fat, 43.84 water, and 12.32 tissues, cells, vessels, etc. Simultaneously, the normal quantity of the water of the fatty liver becomes diminished, and may fall from 76 per cent. down to 43 per cent. The fat consists of olein, margarin, and traces of cholesterin.

In less-marked cases these pathological characteristics are also less distinct. As the hepatic lobules always become affected in such a manner that the cells lying on the periphery of each lobule first undergo fatty degeneration, while the centre of the lobule, about the hepatic veins still remains free and of a normal color, a reticulated appearance of the incised parenchymatous structure is produced, called the nutmeg-liver.

The brownish-red and pale-yellow substances alternate in such a manner, that the first forms small islands, which are surrounded by the latter like a bright-yellow zone. The form of the brown islands depends upon the direction in which the lobules have been cut through. Where the central veins have been cut through transversely, they are round; where the incision falls parallel with the central veins, they will represent oblong or leaf-like figures.

The deposition of fat does not always take place in all parts of the liver alike, hence the islands differ in size, especially those near the surface of the liver, where they may be scarcely changed from the normal appearance.

The microscopic appearance is very characteristic. The morbid change is limited to the liver-cells only, and no free fat is ever found in the intercellular spaces of the parenchyma. The hepatic cells, which, in the normal condition, are but slightly granular, exhibit at first fine, minute oil-drops within their walls, which, increasing in number, at length become confluent, and obscure the primitive cell-granules. The normal constituents of the cell thus obscured may be again rendered visible by removing the newly-deposited fat by the addition of oil of turpentine. The form of these fat-loaded cells is generally roundish, their angles having disappeared.

As regards the remaining functions of the liver, it is remarkable how little they are disturbed. The sugar-generating function of the liver, a modern discovery, but now well understood and appreciated, does not become deranged, nor does the bile it secretes deviate in quality or quantity from the composition of the normal fluid.

It is very difficult to define the boundaries between the physiological and pathological fatty liver, as it is met with in almost all nurslings, from whatever disease they may have died. All young animals who are still nursing usually furnish the same condition.

The disappearance of the fatty liver, as the age of the animal increases, is proof positive that the fat-infiltrated cells do not become destroyed, but that the liver becomes normal by a disappearance of the fat, and that therefore the fatty liver, under certain circumstances, may also be *curable.* The most frequent pathological conditions with which fatty liver associates are: tuberculosis, next rachitis, then hereditary syphilis; and, lastly, those diseases which lead to atrophy, such as enteritis folliculosa, diphtheritis, acute exanthemata, and typhus fever.

Symptoms and Treatment.—It may have been concluded, from what has been already said, that the symptoms of this condition are very uncertain and unreliable. An enlargement of the dulness in the hepatic region is the first cardinal point in the diagnosis, although absence of this sign has no conclusive significance whatever; for in many instances a decidedly fatty liver is found without the least increase in volume. The fatty liver, however, does frequently become enlarged, flattened, and pushed forward against the abdominal walls, where it may be discovered by palpation and percussion. Such cases also present the condition called abdominal plethora, which consists in abdominal gaseous development, giving rise to flatulence and disposition to diarrhœa. The diagnosis becomes most probable when the above-mentioned diseases, tuberculosis, etc., have existed or still exist.

The fatty liver of children will hardly ever become the object of direct treatment. When it is possible to remove the condition which caused it, it will disappear spontaneously; if not, there is no remedy that will exercise a direct influence upon the fat of the liver.

(3.) CONGENITAL ANOMALIES.—The malformations of the liver are either very insignificant, simply affecting its form, or they may affect its organization so seriously as to compromise the life of the infant. As regards the deviations from the normal form, we have a quadrangular, triangular, flat, or round form; the division of the lobes may either be absent altogether or multiplied. As regards the great anomalies, we may mention, first of all, the total absence of the liver in monsters, especially acephaliæ. In diplogenetic monsters a double organ is also present. Similar malformations are observed in the gall-bladder and ductus choledochus. In congenital fissure of the diaphragm, which, on the whole, very rarely occurs on the right side, the liver may mount up into the right pleural cavity, and in congenital rupture of the umbilical cord (*vide* p. 63) it may lie exposed through the abdominal fissure.

In congenital transposition of the viscera the liver lies in the left hypochondrium, and with this a total or partial transposition of the rest of the abdominal and thoracic viscera is always combined. The spleen, as a rule, is cut up into small spleens, which lie in the right hyponchondrium; the cardiac orifice of the stomach on the right, the pyloric on the left side, and the heart in the right thorax.

Hyrtl has seen this transposition of the liver and of the rest of the viscera only four times. I have never yet met with it. The diagnosis cannot by any means be difficult, if a due amount of judgment and care be exercised in the examination.

F.—*SPLEEN.*

Idiopathic, primary affections of the spleen probably never occur in children, but in some acute diseases a secondary enlargement of this organ originates, such as has been more minutely described in typhus abdominalis. It is not as easy to detect an enlargement of the spleen in the child as in the adult, because children, up to the third year, are generally much averse to a protracted examination of the splenic region. It is best to examine them in the dorsal or right lateral decubitus. A normal spleen can never be discovered by palpation; and even the decidedly hypertrophied spleens are often so movable or so soft, especially in typhus fever, that they frequently escape detection. The hard, indurated splenic tumor, found in advanced rachitis and in chronic intermittent fever, may be discovered by palpation, and, in subjects much emaciated, may even be seen pushing out the thin abdominal covering. It moves downward with every inspiration, and upward with every expiration.

In moderate hypertrophy the spleen retains its oblique direction downward and forward; but, in chronic and more marked indurations, it will assume a more vertical position in line with the body, as the ligament pericolicum, which in the normal condition gives it an oblique direction, gradually becomes elongated. The form of the spleen, wherever it can be felt, is very characteristic. It is an oblong oval, with blunt borders, and an indentation on the internal aspect at about the middle of the tumor.

In the examination of the spleen by percussion, very gentle blows should be given, particularly when the intestines are tympanitically distended, because, by heavy blows, the tympanitic resonance of stomach and intestines is developed, and the splenic dulness is lost. This examination should be practised with the patients always in the same position, because variations of the posture alone produce decided changes in the dulness. In general, all those dull sounds of the splenic region, which in children under one year extend under the pleximeter, beyond the normal boundary, are to be considered pathological. In marked ascites, and in serous effusions into the left pleural sac, the dulness of the spleen cannot be detected by percussion at all; it also disappears in intense tympanitis, so that, even when the hypertrophy of the spleen is considerable, a perfectly sonorous tympanitic percussion-sound may be heard over the corresponding space.

Besides the occurrence of the splenic tumor in typhus fever, it is invariably present in intermittent fever, and a description of the latter may therefore very properly follow here.

INTERMITTENT FEVER (*Febris Intermittens*).—Intermittent fever occurs just as often in young children as in adults. Cases are even recorded of infants being born with enlarged spleens, and suffering febrile paroxysms at the same hour in which the mothers had their paroxysms during pregnancy. I have never met such a case; the youngest child that I have had to treat for intermittent fever was eight weeks old. The symptoms to be presently described have reference only to children under two years; in older children the whole course is so characteristic, that every one who has once seen an adult suffering from a paroxysm of intermittent fever will immediately recognize it.

The etiology of infantile intermittent is naturally the same at all ages. The fever is confined to certain locations, and is never observed in children who have not lived, or at least stopped for some time, in malarial regions. The most exhaustive treatise on the etiology of malarial affections is to be found in *Griesinger's* "Infecting Diseases" (Virchow's "Hand-book of Special Pathology"), in which the circumstances of the quantity of the water of the earth, of the temperature, of the climate, etc., are discussed in detail.

Symptoms.—In children, the quotidian type is the most frequent; still the tertian, and even the quartan, also occur. The hour in which the attack comes on is not always the same; the paroxysm, however, is always confined to a certain period of the day; the morning, afternoon, or evening. As regards the attack itself, it is usually not fully developed, but rudimentary in one or more of its phenomena. Actual chills, it is true, occur, in which the children are seized with shivering, low moaning, collapse, and have blue lips and nails; immediately after they become decidedly hot, have a dry skin, great thirst, and restlessness, and finally break out in a general perspiration, thus completing a perfect picture of an intermittent febrile paroxysm. As a rule, however, the symptoms are not so conspicuous, and often leave the malarial character to be divined by their recurrence every day, or every other day, at the same hour. The shivering chills are often totally absent, and a remarkable paleness of the skin, blueness of the nails and lips, discoloration around the eyes, cold extremities, and low whimperings, or slight convulsive twitchings of the facial muscles, are only present. The pulse does not become very much accelerated, but very small. Respiration is normal, as to frequency; the breath does not become cool, nor does the temperature of the mouth sink in the least. During the various symptoms representing the cold stage, children rarely pass any urine; but, if they have partaken of much milk shortly before, they generally throw it up. This stage never lasts longer than one, or, at the most, one and a half hours. During it the child presents a most critical appearance, and the physician may seriously compromise his professional reputation if he should give a prognosis immediately after first beholding the child. I myself once committed such an error in the early course of my professional career.

In the second stage the vessels of the skin become turgid, the face is flushed, the pulse harder and quicker than in the cold stage, the cardiac impulse stronger, and felt over a larger area. There is very great restlessness, the child cries aloud, and is frequently attacked by convulsions, conjointly with which the pupils become remarkably dilated. The urine and stools are retained.

This condition may last from two to three hours, and is much more correctly observed and described by the mothers than the cold stage. But it is also often transient, lasting barely one-quarter of an hour. It is followed by a slight perspiration, the third stage.

While the patients are awake the perspiration is not very well marked; the skin, it is true, feels moist, but drops of sweat are very seldom seen upon it; free perspiration takes place only when sleep ensues. The heat and redness of the face then diminish, the thirst decreases, and the urine is discharged tolerably dark in color. The pulse assumes again its normal condition, and the patients once more present all the signs of general good health. But, in the intervals of freedom from fever, they are seldom perfectly well; are generally very restless, have less appetite, and a sluggish, irregular digestion. The febrile paroxysms are frequently so little pronounced that an observation of several days is necessary in order to confirm the diagnosis.

The intermittent-fever cachexia, in small children, is very soon established, as early as after one to two weeks, and is characterized by the following symptoms:

Anæmia appears very rapidly, the color of the skin becomes perfectly white, or turns to a slight grayish tint, the lips and mucous membrane become pale, the emaciation progresses and becomes marked, slight œdematous swellings form under the eyes, the enlarged spleen is easily felt, and, when the emaciation increases, may even be seen. The liver also swells up, and its parenchyma becomes indurated (lardaceous liver). The intestines are tympanitic with gas, the stools are mostly diarrhœal, and, in the last days of life, sometimes mixed with blood. The important discovery of the presence of brown or black granular pigment-matter in the blood of intermittent-fever patients is an attainment of pathological microscopy for which we are indebted to *Virchow* and *Meckel* (Melanæmia). This pigment is seldom found in the blood of children, because, for this purpose, it is necessary that the cachexia should be much prolonged, which, in children, is generally not the case, as they die of the disease too early. Moreover, intermittent fever is so easily recognized, and its treatment so rapid and effective, that, wherever physicians are consulted for it, it seldom advances to the development of the cachexia.

Pathological Anatomy.—In this country, a child rarely dies during the attack, but, in regions where pernicious fever prevails, death may occur even with the first paroxysm. The anatomo-pathological condition is then purely negative; a slight swelling of the spleen, with a superabundant amount of blood in the whole venous system, are the only abnormities. But, in the bodies of infants who have perished from the cachexia of intermittent fever, various morbid changes are met with, such as anasarca and effusions into the serous cavities, lardaceous liver, large lardaceous spleen, with brown or black pigment-matter most profusely accumulated in the spleen, in the liver, in the brain, upon the mucous membrane, and in the kidneys, which are also frequently affected with Bright's disease. In such cases the urine found in the bladder is always albuminous, and casts may be seen, with the microscope, in its sediment.

Treatment.—The attack itself, in our milder forms of intermittent fever, requires a not very energetic but an expectant treatment. For the cold stage, a high temperature and mild cutaneous irritants are sufficient, such as friction with a woollen rag, with spirits of camphor, or other excitants; cool coverings, cold affusions to the head, the administration of plenty of cold water, and, when convulsions occur, one or two drops of laudanum, answer for the hot stage. The sweating that ensues should be encouraged in every manner possible. During the apyrexia the children must be kept upon a very strict diet, and in a uniform temperature. In sulphate of quinia, however, we have a very efficacious remedy for the prevention of the recurrence of the paroxysms. In children under one year, one grain, given in one dose, is generally sufficient to arrest the attack. To older children, two to three grains are given. The addition of sugar to this dose, thereby increasing its bulk, with the view of improving its taste, is practically useless, if not disadvantageous, for the taste is not improved in the least. In young children it is almost always easy to administer this remedy. But older children, who are not trained to swallow powders wrapped in wafers, are often, notwithstanding their best intentions, unable to swallow them, or refuse to attempt it. In these cases, the employment of the remedy in the form of clysters may be practised; the method is very efficient.

A countryman, from a peat-moor, once brought his boy, five years old, to me, stating that he had suffered daily for six weeks from the fever, which the physician of his place was unable to cure, because it was totally impossible to administer quinine to the child. The boy was very anæmic, had a very large spleen, an indurated liver, marked ascites, traces of albumen in the urine, and slight œdema of the lower eyelids. I ordered him a ten-grain solution of quinine in one and a half ounces of water, and caused it to be administered in a clyster, in my presence, to which the child readily submitted. The man took him home to his moor again, and, although continually exposed to the malarial air, he had no further attacks, but, under a tonic treatment with ℞. *mart. pomat.*, meat diet, and beer, completely regained his former health and spirits.

When one dose of quinine is not sufficient, another must be administered during the next interval. The determination of the hour of administration, upon which great stress is laid by many physicians, seems to be less important in children than in adults. The main point is always for the quinine to be well and thoroughly absorbed, and therefore it is advisable not to give it directly before or after a meal, and immediately before the appearance of the chill, because during it the digestion is interrupted.

In our intermittent fever, quinine has never yet failed in my hands to perform its duty, and for that reason I have never had occasion to resort to arsenic in the treatment of this disease. Still I would not hesitate for a moment, in case of failure, to use it, since Fowler's solution is excellently well tolerated by children. If the cachexia is already developed, an after-treatment will be necessary. The best is the removal of the child from the malarial region to a dry, elevated residence. Where this is not practicable, we have to limit ourselves to iron and a meat diet, combined, in older children, with small quantities of beer.

G.—*PERITONÆUM.*

Peritonitis Acuta and Chronica.—Peritonitis with sero-fibrinous exudation not unfrequently occurs in the new-born child, and even in the fœtus. In older children, on the contrary, it is very seldom seen, without it is traumatic and tuberculous, because, in these, the principal causes of peritonitis—intestinal perforations, and diseases of the female sexual organs—rarely, if ever, occur.

Etiology.—All the forms of peritonitis that it has been customary to assume, in special pathology, are also observed in the new-born child. The idiopathic is the rarest form, and is almost exclusively seen in the fœtus; the secondary is the most frequent, and the metastatic occurs in lying-in houses in which puerperal fever prevails. The latter forms cannot always be positively distinguished. The process takes its starting-point, in both, from the umbilical vessels, which are filled with ichor, but whether the inflammation is simply extended to the contiguous peritonæum, or whether this membrane, like other serous coats, becomes attacked by the pyæmic process, is often impossible to decide. This kind of peritonitis, depending upon an ichorous navel, is only liable to occur so long as the latter exists, six, or, at the utmost, eight weeks after birth. After that time, the traumatic form is only seen, such as that occurring after burns, and perforation of the stomach or bowels, or that resulting from an incarcerated hernia, or from intussusception. The tuberculous form may also be added.

Symptoms.—In peritonitis of the new-born child, pressure upon the abdomen is always painful, so much so, that the sufferers will utter loud but abrupt cries, even at the slightest touch. They are not capable of crying continuously, because the employment of the abdominal muscles for this purpose augments the pain. They are most quiet when they are completely uncovered, so that the abdomen is free on all sides; the legs are extended, and the thighs not drawn up against the belly, as is usually the case in colic, because the pains seem to become aggravated even by the contact of their own thighs. Older children suffering from peritonitis always maintain the dorsal decubitus, and cannot be induced to lie upon the one or the other side. A paretic state of the abdominal muscles is present in all cases, and a more marked tympanitis in consequence. In the new-born child fluctuation can never be felt, because (1) the exudation is a plastic membranosis, and (2) the tympanitic bowels press against the abdominal walls in such a manner that the fluid exudation when present is below and behind the bowels.

Vomiting is much less regularly observed in peritonitis of children than in that of adults, and diarrhœa is oftener present than constipation. The appetite is completely lost, but the thirst is great. If the peritonitis has reached the serous coat of the bladder, retention of urine will supervene, or a few drops only are discharged at a time, attended by severe pain. The febrile signs are always distinctly pronounced; the skin is hot and dry, the pulse frequent and small, and the breathing rapid and superficial. The respiration is distinguished from that of health by the circumstance that the diaphragm does not act at all, or but very little, while the pectoral muscles seek to produce the utmost possible dilatation of the thorax. But, since the proper inflation of the lungs cannot by any means be accomplished by this kind of respiratory act, the children are compelled to execute one deep diaphragmatic inspiration for every ten to fifteen of those superficial ones, and this, being attended by pain, is accompanied by distortion of the face, and frequently by a pitiful cry. The color of the face is oftener pale than flushed; convulsions occur here less frequently than in pneumonia.

Peritonitis of the nursling, as a rule, terminates fatally after from one to three days. Tuberculous inflammation of the peritonæum of older children runs a longer course, and may even last for many months. But the lethal termination is also in this form almost unavoidable.

Pathological Anatomy.—The peritonæum exhibits at different places, especially on the contiguous surfaces of two intestinal coils, capillary injection and plastic exudation, by which complicated adhesions are produced. In peritonitis of the new-born child, which is due, almost invariably, to a phlebitis umbilicalis, the principal morbid alterations are found about the umbilical ring and on the concave surface of the liver, which, by plastic exudation, becomes agglutinated to the neighboring organs, the stomach, and large and small intestines. In the small pelvis some ounces of a purulent, sanious, or bloody fluid, are usually found. In the two cases of fetal peritonitis recorded by *Billard*, numerous tense bands and old adhesions were found present in the cadavers of the still-born infants. Lobular pneumonia is often present as a complication.

The treatment of peritonitis, as may be gathered from what has been hitherto said, is a most unsatisfactory one. That resulting from phlebitis umbilicalis seems almost invariably to be fatal. The treatment, therefore, which secures rest, cleanliness of the navel, and the best possible sustaining measures, seems the only one indicated. In tuberculous peritonitis, hectic fever, as a rule, is present, and, as its subjugation is altogether out of the question, we have to be content with trying to remove the febrile symptoms by the aid of small doses of quinine and morphine. For the peritonitic pains I use warm moist compresses, which are covered by a piece of gutta-percha cloth, and this by a dry cloth. They are much cleaner and more convenient to apply than cataplasms, which, especially at night, become cold and hard, and possess at no time any superiority to the application recommended. Traumatic peritonitis does, indeed, tolerate an antiphlogistic treatment to the extent of from three to twelve leeches, and, in case no diarrhœa be present, the addition of several doses of calomel, gr. ss. to j, during the day, till a green diarrhœa takes place. The warm-water compresses above described should always form part of this antiphlogistic treatment, for they afford the greatest relief. If the pains are very persistent, opium is also indicated, as it is in most painful diseases.

(2.) ASCITES. HYDROPSICAL EFFUSION INTO THE PERITONEAL SAC.—Ascites is never a primary affection, but always a mere symptom of some other constitutional or circulatory disturbance. In young children it is inconsiderable as to quantity, often only a few tablespoonfuls of serum being found at the autopsy. Thus, children who die from hereditary syphilis, tuberculosis, marasmus, the effects of enteritis, from congenital malformation of the heart, or scleroma, have small serous effusions in the abdomen. Considerable, easily-demonstrable effusions occur only in children who are over one year of age, and generally as a result of scarlatina, or of intermittent fever, and occasionally, but less frequently, of abdominal typhus.

Pathological Anatomy.—In old children the quantity of the ascitic fluid may reach several pounds. The color of the serum is a wine yellow; sometimes a little coloring matter of the blood is also mixed with it. The reddish color thus produced may, however, also be due to one or another of the cutaneous veins having been cut at the opening of the abdomen, and their contents escaping into the peritoneal cavity. The chemical investigation gives a large percentage of albumen, and the salts as they are found in the serum of the blood. The peritonæum is either perfectly normal, or at some places displays white opacities, which are principally observed in protracted cases of ascites. Occasionally one of the intestinal coils or the liver is coated with a thin layer of exudation, so that we have to deal here with a transition into true peritonitis. In no autopsy should the mere finding of ascites content us, but its cause, one of the above-mentioned affections, should be sought for, in which the heart and kidneys, in particular, are to be subjected to the most scrutinizing investigation.

Symptoms.—The existence of ascites can only be satisfactorily proven by distinct fluctuation. Small effusions can never be detected in the dorsal decubitus; occasionally they may be discovered, by laying the children on the right side, and slightly elevating the pelvis, whereby all the serum then gathers into the right hypochondrium. The smallest quantities, however, may be detected by laying the child upon its belly, and then causing it to be raised up, so that the navel will form the most depending part of the whole abdomen. As in this position all the serum must gather round about the navel, it is then easily detected by percussion from below upward. Fluctuation is ascertained in this manner. The palmar surfaces of the fingers of one hand are made to press against the abdominal parietes, while with the tips of the fingers of the other the abdomen is quickly and lightly struck at a point opposite to the pressing hand, or at least at a distance of a few inches from it. The undulation thus produced, in case fluid be present, between the pressing and the striking hands, communicates a peculiar thrill to the former. Besides being produced by the free fluid of ascites, fluctuation also originates from the presence of diarrhœal contents of the intestines, from a bladder filled and mounting over the symphysis, and even from œdema of the abdominal walls, which, especially in nephritis after scarlet fever, is commonly very intense. The latter, however, is readily distinguished from true ascites, by the pitting from the pressure of the finger, and by the superficial character of the flaccidity. The distended bladder is easily emptied, and the intestinal catarrh readily relieved by a mucilaginous diet and small doses of opium, whereupon the true state of affairs will become manifest.

In mild grades of ascites, nothing can be discovered externally, and the circumference of the abdomen is not materially increased; but in the higher grades attention is attracted to the size of the belly, even at the first sight. The integument is glistening and tense; there is flatness on percussion of the lower part of the abdomen, the dulness extending over a large surface; the umbilical ring is distended, and the navel prominent. The pressure of the serum excites frequent inclinations to micturate, but only small quantities of urine are evacuated at a time.

The general phenomena, loss of appetite, fever, respiratory disturbances, etc., correspond with the conditions causing the ascites. The patients, as a rule, perspire but little, and pass very small quantities of urine. It is mostly dark-colored, and, in nephritis, contains albumen and fibrous casts. The stools are often diarrhœal.

The prognosis does not depend upon the amount of the ascites, but upon its etiology. It may be regarded as unfavorable in almost all kinds of ascites, except in that originating after scarlatina, typhus fever, and hypertrophy of the spleen from febris intermittens.

Treatment.—This, of course, varies according to the cause. The conditions which give rise to ascites are of such a hopeless nature, that any special treatment, except a stimulating *régime*, will hardly be indicated. When caused by nephritis, after scarlatina, *roob** *juniperi*, which children usually take very readily unmixed and undiluted, is an excellent diuretic remedy; I direct one-half or a whole teaspoonful to be taken daily. It is also applicable in ascites after intermittent or typhus fever, but then a tonic treatment, consisting of a meat diet, beer, wine, and small doses of iron, is to be recommended in addition. The ascites which comes on after scarlatina subsides more rapidly than any other.

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* This is the succus spissatus juniperi of the European pharmacopœias, and is somewhat stronger than a fluid extract.—Tr.

(3.) MORBID ALTERATIONS OF THE MESENTERIC GLANDS.—In all cases of enteritis folliculosa, the mesenteric glands become hypertrophied and indurated, and their impermeability most probably affects the atrophy that so frequently follows it, a detailed description of which has already been given in connection with that disease (p. 156). In addition, cheesy tubercles of the glands occur in older children; and, in those who perished by typhus fever, hypertrophy, or small abscesses of single glands, are sometimes met with.

The diseases of the mesenteric glands do not seem to give rise to any symptoms, but the nutrition, if a large number of the glands is involved in the hypertrophy, suffers very quickly. The glands, on the whole, are so small, and the bowels are always too tympanitic, to allow them to be felt.

CHAPTER III.

DISEASES OF THE ORGANS OF CIRCULATION.

A.—*HEART AND VASCULAR TRUNKS.*

(1.) CONGENITAL ANOMALIES.—For the purpose of correctly understanding the congenital anomalies of the heart, this much of the embryology has to be premised: that the heart and roots of the vessels at the commencement of development are not hollow, but consist of a loose conglomerate mass of cells, without any chasm or channel, and without any cavities. At this period the heart still possesses the form of a straight cylinder, which above and below terminates in two prolongations; the two lower prolongations, the venæ omphalo-mesenterica, are the roots of the vessels which subsequently ramify in the germinal vesicle and conduct the blood from it to the heart; the two upper prolongations are the two future first aortic arches, which, in the embryo, carry the blood *from* the heart. The external upper surface, according to *Bischoff*, very gradually becomes firmer by the cells being deposited closer to each other, and thus the walls are formed, and a *cavity* is developed within, in which the fluid and cells, forming the first trace of the blood, accumulate. The cardiac cylinder then assumes an S-like shape, and begins to contract and dilate in a slow rhythm, by which its fluid contents are propelled anteriorly and upwardly into the aortic arches, while that from the venous trunks, on the other hand, is sucked in from below and behind.

By-and-by this cardiac canal, by various curvings, dilations, and constrictions of single parts, becomes the heart proper, consisting of the aortic dilatation, *one* ventricle and *one* auricle. The septa do not become developed till a later period, by which the right and left ventricle and auricle are formed. Imperfect development or faulty insertions of these partition-walls are the most frequent causes of malformation of the heart.

Nevertheless, cases of malformation are also observed as the result of an embryonal inflammatory process of the muscle of the heart, and its consequent atrophy and cicatrizations.

The best compilations on the congenital anomalies of the heart are to be found in the text-books of *Rokitansky* and *Bamberger*, which have furnished the basis for the following summary:

(1.) *Absence of the heart* (acardia) occurs only in monstrosities, where the upper half of the trunk is at the same time wanting, and the nervous system consequently exists only in a rudimentary form. The converse of this is the duplex heart in double malformations (diplogenesis); this occurs especially in doubling of the upper half of the body, where two completely-separated hearts either occupy each a separate pericardium or a common one.

(2.) *Abnormal situation of the heart.*—Here we may have the fœtal heart occupying a central position in the thorax, or *transposed*, so that the cardiac impulse is felt at the right of the sternum. In this latter case we have generally an accompanying displacement of other organs, particularly the liver and stomach.

Again, the sternum may be absent and the integument wanting, and when this condition occurs we have the heart entirely exposed, or merely covered by the pericardium.

If a greater portion of the thoracic and abdominal walls is wanting, we have the condition called eventration, in which the abdominal organs lie without the body.

In very rare instances a defect or splitting of the diaphragm occurs, and the heart then penetrates through this opening into the abdominal cavity.

(3.) *Abnormal shape and size.*—Variations of the shape of the heart are often devoid of importance. It may be broad, cylindrical, or fissured at the apex. A pointed and a round heart may perform its functions naturally, whereas, on the contrary, abnormal bigness or smallness of the whole heart, or some of its parts, is complicated with functional disturbances. The right ventricle is most frequently found enlarged in consequence of the fœtal circulatory passages having remained open.

(4.) *Abnormal formation of individual parts of the heart.*—Here we meet with abnormities (*a*) of the *septa*, (*b*) of the *roots* of the *vessels*, and (*c*) of the *ostia* (orifices) and *valves*.

(*a*.) If the formation of the septa has failed to take place, there will be but *one* ventricle and *one* auricle. Generally, however, the septa are indicated by projecting bands, or are fully developed in one or the other chambers, so that there may be two completely separated auricles and only one ventricle, or *vice versa*. As the foramen ovale, even in the physiological state, at first furnished a small communication between both auricles, so do we also here find the most frequent defects. It also happens, sometimes, that the left auricle communicates with the right ventricle, or, *vice versa*, through an oblique communicating passage. Most of the cases are then also complicated with extensive defects of the septa and faulty origin of the roots of the large vessels, which may also be produced by the insertions of the septa having left the median line. It thereby becomes possible for the inferior vena cava to terminate in the left instead of the right auricle, or for the aorta to originate from the right side of the heart.

(*b*.) As has been already stated, abnormities of the roots of the vessels depend, in a great measure, upon an imperfect development or faulty insertion of the septa. The most frequent deviations are:

(1.) The pulmonary artery is either entirely absent, or is very much constricted at its origin, and only becomes dilated beyond the duct. arter. Botalli, which conducts the blood to it from the aorta. When there is only one ventricle, the aorta supplies the place of the pulmonary artery.

(2.) What has been said of the pulmonary artery may also happen with the aorta—it may be misshaped or completely closed; it then receives its blood from the pervious remaining ductus Botalli.

(3.) The fetal type of the distribution of the blood is wholly retained, the aorta supplying the upper half of the body with blood, and the pulmonary artery, through the Botallian passage, the lower half of the body.

(4.) A transposition of the large vessels has taken place, the aorta springing from the right, the pulmonary artery from the left ventricle.

(5.) Both vessels originate from one ventricle.

(6.) The aorta has two equal or unequal roots, one of which springs from the left, the other from the right ventricle.

(7.) The bulb of the aorta is immensely enlarged and represents a third ventricle.

(8.) The ductus Botalli often remains permeable, or is absent altogether, or may become developed into a permanent vascular trunk.

The partial occlusion of the aorta at the other side of the opening of the Botallian passage deserves a more detailed description, an anomaly which has been closely investigated, especially by *Rokitansky*. A great constriction of the aorta occurs at this place, which may be but a few lines in length, and then terminates in an aorta descendens of a perfectly normal calibre. This anomaly is produced by the arteria pulmonalis in the fœtus forming an arch, is continued in the descending aorta, while the blood of the aorta is only transmitted into the arteries of the head and arms, the innominata, carotids, and subclavia sinistra. The blood of the pulmonary artery flows through the wide duct. Botalli into the aorta. A narrow vascular piece runs to the arch of the pulmonary artery, which may be regarded as a continuation of the aorta, and is described under the name of isthmus aortæ. After birth, the course of the blood is deviated from the duct. Botalli by the dilatation of the lungs; that passage soon becomes impermeable and obsolete, and, at the same time, the originally narrow vascular piece, the isthmus aortæ, becomes dilated to the diameter of the normal aorta. Now, if this dilatation of the aorta does not take place after birth, and the Botallian canal nevertheless becomes obliterated, a permanent constriction of the isthmus aortæ will be the result.

A collateral circulation then forms for the blood from the left side of the heart, the road for which to the lower half of the body has thus become obstructed, by which that section of the aorta below the constriction is nevertheless filled with blood. For this purpose, the branches of the subclavian artery become dilated, and assume a serpentine course. The most important branches which enter into the formation of this new connection are: the internal mammary, the rami intercostales, which conduct the blood into the rami intercostales posteriores, anastomosing with them, and which originate from, or, more correctly speaking in this case, terminate in the descending aorta. Further, the anastomoses between the internal mammary, superior epigastric, and the lumbar arteries; next the arteria intercostales suprema with the intercostal branches of the mammary; and, lastly, the arter. dorsalis scapulæ with the dorsal branches of the intercostal arteries.

In this manner, the descending aorta becomes completely filled; still it never acquires the normal calibre, whereas the arch of the aorta up to the place of constriction is seen to have become completely dilated. These individuals are perfectly capable of living many years.

(9.) The venous terminations in the auricles may be transposed in the same manner as in the case of the arteries with the ventricles, or the vena cava and the pulmonary veins terminate in *one* auricle only, etc.

(*c*.) Congenital abnormities of the valves, and ostia in general, are comparatively rare, and can more readily be attributed to fetal inflammatory processes, fetal myocarditis, than to an actual arrest of development. The most frequent occurrences are:

(1.) Stenosis of the conus of the pulmonary artery, or of the aorta, a condition in which the muscular structure forming the conus has become converted into a white callous mass. This stenosis occurs more frequently at the pulmonary artery than at the aorta, and, according to *Bamberger*, is one of the most frequent causes of congenital cyanosis. The foramen is invariably found open, or the septum of the ventricle has not even become completely developed.

(2.) The valves may be cartilaginous, hypertrophied, or the auriculo-ventricular valve thickened, and numerous columnæ papillaries, and falsely-inserted chordæ tendinæ, occur; or, on the contrary, the valves are transparent, very much attenuated and perforated. In rudimentary construction of the large arteries or false insertion of the septa, the tricuspid or semilunar valves may also be completely absent.

(3.) The valve of the foramen ovale may be absent altogether, or become prematurely closed; various malformations have already been observed on the Eustachian valve too.

Symptoms.—Numerous descriptions of the congenital malformations of the circulatory apparatus are to be found in the dissertations and larger monographs, but the symptoms accompanying them are seldom pictured sufficiently in detail, and, even where this is the case, they will be found, as a rule, not to harmonize in one and the same anatomical condition. According to *Bamberger*, all the malformations in reference to their symptoms may be comprised in three groups:

(1.) To the first group all the malformations belong which produce an absolute incapacity for living, such as monstrosities, ectopia of the heart, with absence of the integument, complete univentricular heart, and transposition of the large vessels.

(2.) In the second group may be included all those malformations with which children may indeed live, and laboriously or even normally continue to develop throughout the first few years, still with every additional year they experience an aggravation of their disturbances of the circulation, so that death ensues in the course of the first, at the latest in that of the second dentition. To this class belong congenital constriction of the conus of the pulmonary artery, and that of the aorta, extensive communications of the ventricles, or of the auricles, or of a ventricle with its opposite auricle, the origin of the aorta from both ventricles, and the remaining previous state of the duct. Botalli.

(3.) There is a number of minor anomalies, by which the circulation is in no way impeded, and consequently no hinderance whatever is offered to the development of the child. To this group belong particularly the external alterations in the form of the heart, the splitting of the cardiac apex, and the conical, cylindrical, broad, and circular form. The transposition of the heart to the right side, generally complicated with transposition of the liver and stomach, is devoid of any influence upon the continuation of life. The remaining open of the foramen ovale is likewise entirely unimportant, as has already been proven by numerous *post-mortem* examinations, nor is there the least plausibility for regarding it as the cause of cyanosis, to which, however, we will recur once more, further on.

The time of the appearance of symptoms is extremely variable. It is certainly true that the disturbances of the circulation produced by congenital defects of the heart may, at first, be insignificant, and may very gradually increase from month to month, but the statements of some authors seem very improbable, who maintain that congenital defects of the heart do not give rise to any symptoms till after many years, even not till after puberty. Those authors undoubtedly have fallen into some error, and certain acute diseases of the heart have been overlooked. Many children, on the whole, have displayed the most distinct signs of marked disturbances of the circulation immediately after birth. They come asphyxiated into the world, and soon after perish by atelectasis of the lungs. They cry but lowly and discontinuously, are always cool, somewhat cyanotic, sleep a great deal, and suffer from convulsive attacks of coughing, by which the cyanosis rapidly increases, and the protruded tongue especially assumes a dark, bluish-red color.

Cyanosis is always the most constant and reliable symptom, but concerning its origin partially incorrect views still exist. Formerly, it was assumed that cyanosis in congenital malformations of the heart was produced by the mixing of arterial and venous blood, as thus, when dark-red blood, in the normal condition, found its way into the arterial system of vessels. That this view is incorrect is seen from the forms of cyanosis, in which the anatomical conditions of the heart are perfectly normal, for example, in cholera or in poisoning with carbonic-oxide gas. In these cases, as is well known, the cyanosis is of an intense degree, and yet no traces of any morbid lesions are found about the heart at the *post-mortem* examination. The foramen ovale, on account of this same fallacious supposition, has also received altogether too much attention, and it was a matter of no consequence, when a probe could be passed from one auricle into the other, whether the valve was perfect or not.

The only test-bearing reason for the cyanosis is to be found in an imperfect oxidation of the blood in the lungs, combined with a stasis in the peripheral venous system. But this process may be produced by various conditions; either an impediment exists at the left side of the heart, and conjointly with this there is stagnation of the blood in the pulmonary veins, or the supply of blood to the lungs is diminished in consequence of a stasis in the right side of the heart, and hence less blood is arterialized, or the circulation meets with impediments in the lungs, the effects of structural lesions, or, lastly, the inhaled air is poor in oxygen, and in that case the blood is likewise but imperfectly oxidized. The blood may also become so altered in consistency that its flow will thereby be retarded, and this is especially applicable to the inspissation of the blood in cholera. Thus we see that the causations of cyanosis are tolerably numerous, and are by no means solely to be sought for in mechanical alterations of the heart.

The degrees of cyanosis vary exceedingly, and fluctuate between a slight bluish discoloration of the lower eyelids and a bluish redness of the whole body, and all supervening congestions produce an aggravation of the existing cyanosis. Too high and too low temperatures, excitement, crying, laughing, bodily exertions, are therefore the most frequent causes of this aggravation.

When children with congenital malformations of the heart survive the first few years, various other symptoms of disturbance of the circulation become superadded. Almost all of them suffer from imperfectly-developed pectoral muscles and pigeon-breast. The extremities are always cold and moist, very much like the skin of a frog, the tips of the fingers swell up bulbous, over which the nails, curved like claws, project; the cutaneous veins are preternaturally large; the patients are unable to exert themselves in any manner, whether to run or climb, or to cry continuously, for all these efforts cause them severe pain in the præcordia, dyspnœa and palpitations. Hæmoptysis, also, in rare instances, is observed in larger children; epistaxis, on the contrary, is a symptom which occurs tolerably often, and as a rule gives momentary relief. Finally, general dropsy of the cellular tissues and of the serous sacs, with which albuminuria becomes associated, terminates the distressful existence of these children.

The physical examination of congenital cardiac malformations is attended by extraordinary difficulties. Hypertrophy of the heart is almost unexceptionably demonstrable, and is usually due to a marked enlargement of the right side of the heart. In this condition the heart's impulse is felt over a larger space, and stronger than usual. Distinct cardiac murmurs can seldom be elicited by auscultation; in most instances a confused sound is only heard instead of the one or the other, or even in place of both cardiac sounds. Prolonged loud murmurs allow one to conjecture the existence of a marked abnormal communication between the cardiac moieties, a perforation of the septum for example; a strong systolic murmur heard most distinctly over the pulmonary artery indicates a constriction of this vessel, one of the most common malformations that occur. Sometimes, however, the auscultatory phenomenon is not adaptable to the one or to the other evil, and no nearer approach to an accurate diagnosis can be made than of congenital defect in general. The periods of the first and second dentition, according to statistical compilations by *Friedberg* and *Aberle*, are especially dangerous for children with congenital defects of the heart. Out of 139 cases, 53 died in the first year, 51 between the second and eleventh year, 30 between the eleventh and twenty-fifth, and 5 only attained to an age of over forty-four years.

Treatment.—A direct treatment, of course, is altogether out of the question; we have to limit our efforts to the prevention of all possible injuries, and to institute an appropriate dietetic *régime*. The restrictions concerning the necessary rest are easily enforced in these children, for they are soon taught by experience how injurious and painful any accelerated action of the heart is to them. As regards the diet, no particular precautionary measures need be prescribed; all heating and alcoholic drinks, however, must be absolutely prohibited. Warm clothing is extremely advantageous in these cases, and a flannel shirt should therefore be particularly recommended to be worn next the skin. All antiphlogistic treatment, with calomel, leeches, cantharides, etc., must under all circumstances be avoided, for dropsy and the fatal end are perceptibly accelerated by it. Active congestions, which in these cases are liable to occur extremely often, must be relieved by the external application of cold, acidulous drinks, and strict diet.

If the children come asphyxiated into the world, the methods of animation already recommended for asphyxia should be resorted to, but in these cases they almost always prove fruitless.

(2.) Endocarditis, Pericarditis, and Rheumatismus Acutus.—We include here three morbid pictures in one frame, which anatomo-pathologically have no similarities whatever to each other; clinically, however, they can scarcely be separated, if it is desired to avoid the numerous repetitions which must occur in describing the individual alterations separately. Added to this, these morbid conditions are extremely rare in children, and it hardly seems necessary to give a very exhaustive account of them.

Symptoms.—We commence with the symptoms of acute rheumatism, and then allow the most frequent complications, endo- and pericarditis, to follow:

Rheumatismus acutus.—Acute rheumatism of children differs but little from that of the adult, only its course is shorter, and the affection, as a rule, less intense. The youngest child that I have had to treat, for well-marked acute rheumatism, with endocarditis, was one year and nine months old, and after three months succumbed to disease of the heart. This is a very rare case, for in all the text-books it is stated that children of six years and over are only liable to this disease. Many affections, which by the laity are denominated by the vague name of "growing fever" (Wachsfieber), belong to this condition.

Intense fever is always present at first, the skin becomes burning hot, the thirst great, the pulse enormously accelerated, and great restlessness and sleeplessness supervene. This intense fever at the utmost lasts eight to ten days; it then gradually subsides, and only when pernicious complications have become superadded, particularly affections of the heart, will it continue for an indefinite time and without interruption. In most instances the patients are very pale and collapsed, have a remarkably sad, painful expression of countenance, and a lethargic appearance; they keep the affected joint in the utmost possible state of quiescence, while the free extremities, on account of the intense fever-heat, are incessantly restless and agitated.

The essentiality of the disease consists in a swelling of the various joints, predominantly those of the lower extremities, which are affected in the same manner as in the adult. Touching and still more the moving of the diseased members is extremely painful, and the patients, with an expression of the utmost anxiety in their countenances, will guard over and admonish against every approach to the painful joint. The swollen parts are always reddened at first; the redness, however, disappears before the tumidity does. The knee-joints are most frequently affected, next in order of frequency follow the joints of the ankles, then those of the upper extremities, and lastly the spinal column.

These swellings of the joints never pass over into suppuration: they abate completely, and disappear without leaving any traces of the disease behind them; in some instances a slight weakness and painfulness, on using the extremity, will be the only evidences of the previous existence of the malady. The pathognomonic sign of the affection is its wandering, or its alternating, from one joint to the other. Only extremely rarely is the process completed with the simultaneous implication of several joints; usually, in a few days after the swelling of the joints first affected has declined, new ones will be attacked with the same severity and run a similar course, and this may be succeeded by a second and even a third accession.

The general symptoms correspond to the severity of the fever. The appetite is very much abridged, or completely gone, the stools are retained, the urine is dark-colored, rich in uric acid, and voided in small quantities only. The patients perspire very much, and are thickly studded with miliaries.

The diagnosis of acute rheumatism is very easy, since it almost wholly attacks older children, who are already able to give a rational account of their sufferings. It can only be confounded, in its incipiency, with the prodroma of an exanthema, or with typhus fever, where also very severe pains in the knee and ankle joints occasionally occur. The latter, however, are recognized by the facts that the joints do not swell, and that slight pressure or passive motion does not particularly aggravate the pain, which is always the case in acute rheumatism. If it is at all possible to confound the disease under consideration with scrofulous arthrocace, with tumor albus, then this can only happen in its incipiency, and the error can continue but a few days, as no wandering of the malady from joint to joint occurs in the latter affection, and its course is of a totally different and chronic form.

Simple acute rheumatism, without any complication, has a duration of fourteen days at the utmost. But when it is complicated with cardiac affections, as is the case with at least one-third of all the cases affected, its duration will then be indefinitely prolonged, and a fatal end may occur even after a sickness of many years. Under the head of complications (a.) Endocarditis and (b.) Pericarditis deserve a special consideration.

(a.) *Endocarditis.*

Pathological Anatomy.—The excellent investigations of *Luschka* have established the fact that the endocardium is composed of the same number of layers as the vessels. The superficial surface is formed by a thin stratum of pavement-epithelium, which must be regarded as the direct continuation of that of the vessels. Then follows a layer of extended longitudinal fibres; next, one of very fine elastic fibres, which frequently interlace with each other, analogous to the contractile coat of the vessels; and, finally, a layer of connective tissue unites this elastic coat with the muscles of the heart. The vessels and nerves are found almost entirely in this connective tissue, and are but little in contact with the elastic fibres, which accounts also for the circumstance that a true exudation can only take place in the former. The exudation, however, soon forces the super-lying coats aside, and makes its appearance in the cavity of the heart, on the other side; it also attacks the subjacent layers of the cardiac muscle, so that a slight degree of myocarditis always accompanies endocarditis. Red spots, according to *Luschka*, are at first observed on the endocardium; the superficial surface as yet is still perfectly smooth; this smoothness, however, soon disappears, the superficial surface becomes rough, and now the exudation under the microscope exhibits entire and destroyed epithelium-cells, exudation-corpuscles, and fibre-elements. The roughened places on the endocardium soon arrest some fringes of fibrine, from the onward-flowing current of blood, and thereby acquire a flocculent appearance. This endocarditic exudation, according to *Bamberger*, may undergo the following metamorphosis:

(1.) The exudation may be completely absorbed; this, however, only seems to be possible in very thin layers that have not yet penetrated through the epithelium.

(2.) In most instances it does not disappear entirely, but produces permanent alterations upon the inner surface of the heart. The most common morbid appearances of this kind met with are white condensed places, a condition that has been called tendinous spots (Sehnenflecke), which are always disposed to atrophy, and undergo cicatricial contraction, and now, in case these occur on the valves or in their immediate vicinity, will cause them to shrink or alter their attitude and insertions. Thus, endocarditis is the main cause of subsequent cardiac disease. In other cases, the endocarditic exudation has the disposition to degenerate into polypoid extuberations, and then will possess many points of resemblance to pointed condylomata, and, in consequence thereof, have even been falsely regarded as true manifestations of syphilis.

(3.) It has become evident, mainly through *Virchow's* indefatigable researches, that some of the already coagulated portions of the exudation may also be torn off from the endocardium, and washed away by the current of the blood, and in this manner thrombosis form in different parts of the body. The most common sites of these thrombi are in the spleen, next in the kidneys and brain. Death almost invariably ensues from such a displacement of the thrombi.

Symptoms.—When the endocarditic exudation is so deposited that it cannot materially influence any of the valves, it will not be possible to ascertain its existence by a physical examination; moreover, the functional phenomena are so variable and so imperfectly described, even by large children, that it seems almost impossible to form a diagnosis. Generally, however, extuberations form upon the valves, and then distinct physical alterations ensue.

The left side of the heart is affected much oftener than the right; and the mitral valve, in fact, most frequently of all. Not only the deposits upon the valve itself, but also those in the vicinity of the columnæ carnæ and columnæ papillares, are capable of producing a distortion of the valve, or causing it to atrophy, and thus effect its insufficiency. We therefore have, as the most common physical signs, a systolic murmur, in place of the first sound of the heart, heard with the *greatest distinctness* at the apex of the heart, *less distinctly* over the aorta, and *not at all* over the carotids. The right side of the heart soon becomes consecutively enlarged, so that the dulness in the præcordia extends over a larger space, and the heart's impulse is felt correspondingly stronger, and over a larger area. If the extuberations around the ostium venosum of the left ventricle* become very numerous, a stenosis will then also take place at this ostium, and thus produce a diastolic murmur; this condition, however, seems to be exceedingly rare.

The semilunar valves of the aorta may likewise become involved in the endocarditic process, and, through shrinking and perforations, become insufficient. But, the more common phenomenon observed on these valves is, their becoming covered with vegetations, and thus giving rise to a stenosis at the ostium arteriosum. A systolic murmur is likewise heard in this case, but it is most distinct over the aorta, and is plainly propagated into the carotids.

The right side of the heart is much more rarely attacked by endocarditis than the left, and the murmurs which occur there must be interpreted in the same manner as in the case of the left ventricle, but, in this case, the stagnation of the blood in the veins of the neck is much more pronounced than in valvular disease of the left ventricle.

The functional symptoms of endocarditis vary exceedingly. The pain is seldom regularly present, or very severe; oppression of the chest, anxiety and incessant restlessness, so far as the acute rheumatism will allow, are much more constant. Still, all these symptoms are more pronounced in pericarditis than in endocarditis. Palpitation of the heart is always present, and is increased on exertions, such as crying and bodily exercise; and a peculiar nervous dyspnœa, or shortness of breath, invariably comes on at the same time, which at first reveals no demonstrable mechanical causes; later on, however, it is satisfactorily explained by the stagnation of the blood in the left auricle.

Children laboring under endocarditis always have fever, and, if they have already got rid of the fever which accompanied the acute rheumatism, will again be attacked by violent febrile symptoms on the appearance of this complication. They last for an indefinite period, often for many weeks; to their intensity, and not to the commencing cardiac defects, is the serious emaciation of these children in greater part due. Furious delirium occasionally comes on, and when conjointly with this the spleen is also enlarged, a condition that is very apt to occur in a marked degree when emboli form in it, then this group of symptoms may very readily be taken for that of typhus fever. Secondary symptoms, produced by the displacement of emboli, are, on the whole, extremely rare in children. I have so far only once found embolic formations in the spleen and kidneys; the child was eight years old, and he died from endocarditis.

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* Auriculo-ventricular opening.—Tr.

The diagnosis of endocarditis is almost always attended by the greatest difficulties; and this fact must especially be taken into consideration here, that not every blowing murmur of the heart indicates endocarditis, for children laboring under febrile diseases very often and very quickly get anæmic murmurs, which disappear spontaneously as soon as convalescence commences. This is particularly observed in cases where abstraction of blood, even only locally, has been practised; and, as this remedy is often also resorted to on account of the rheumatic pains, anæmic murmurs are therefore apt to supervene as the effect of acute rheumatism.

In addition to a blowing murmur, a more extensive impulse, an enlargement of the heart demonstrable by greater dulness on percussion, acceleration of the pulse, and dyspnœa, are requisite for the purpose of correctly diagnosticating an endocarditis. The terminations of this disease are entire recovery, complicated sequelæ, or death. Complete recovery from a tolerably well-developed endocarditis must, in fact, be accounted as one of the greatest rarities, because the residue of the exudation commonly produces alterations of the valves, and herewith cardiac disease. Death seldom takes place at the climax of the disease by exhaustion or the formation of emboli; in most instances the patients waste away under incessant fever, accidental diarrhœa, or bronchitis, or perish by lobular pneumonia. The cardiac affections which originate from this disease often develop themselves, after many months, by the shrinking of the exudation, and exercise more and more influence upon the circulation, till finally the cardiac sequel, as such, makes itself manifest, and after a shorter or longer duration brings about a fatal end.

(b.) *Pericarditis.*

Pericarditis has been diagnosticable with certainty only since the discovery of the pericarditic friction-sound by *Collin*, in 1824. But the diagnosis even at the present day is still extremely difficult and imperfect, as will be perceived from the following remarks:

Pathological Anatomy.—A general and a circumscribed pericarditis, according to the extent of the affection, is spoken of. But pericarditis possesses the utmost disposition to spread, and the general is therefore more frequently met with than the circumscribed. The morbid lesion may just as readily begin on the parietal as on the visceral coat; and on either an injection, immediately followed by plastic exudation on the surface, takes place early in the course of the disease.

Different forms of pericarditis are distinguished according to the nature of the exudation.

(1.) The fibrinous exudation. In this form, the external surface of the heart and the pericardium are thickly coated with a shaggy, yellowish-white membrane, and are either entirely or partially united with each other. This exudation is capable of becoming organized, and in it capillary vessels soon become developed, which are often the means of occasioning small extravasations. Conjointly with this organized membrane there is always a greater or lesser quantity of fluid effusion, which, on account of the presence of dissolved shreds, and flat gelatinous particles of lymph, appears yellowish, turbid, and flocculent. Generally, this fluid portion of the exudation is subsequently absorbed, when the firm inflammatory membranes will be everywhere in contact with each other, and now either become firmly and intimately united with each other, or, when the plasticity is but slight, they will be ground off against each other, and almost entirely disappear. The condition denominated tendinous spots (Sehnenflecke) must be regarded as a residue of these processes, and the extraordinary frequency with which they are met in autopsies might readily convince us that partial pericarditis is often overlooked. Ossification of the exudation—a condition that is occasionally observed in the autopsies of adults—is not known, to my knowledge, in the Pædiatrica.

(2.) The purulent ichorous exudation. When the fluid effusion, conjoined with the fibrinous membranes, is of large quantity, and has a purulent consistence, the pericarditis is denominated purulent. No actual boundaries, however, exist between this and the preceding form, for in both alike liquid and membranous effusions occur together. It may very readily happen that a pericarditis, which primarily must have been described as purulent, after a while, when the liquid part of the exudation has been absorbed, becomes fibrinous. In newborn children, on the contrary, the ichorous pyæmic pericarditis is almost exclusively met with. This form will be described more minutely in connection with pyæmic pleuritis. It never occurs by itself, but always in common with pleurisy or peritonitis, and is distinguished by being tolerably thin, of a brownish-red color and ichorous odor, and also by the flakes of lymph suspended in it not being yellowish-white, but of a grayish-brown color. Phlebites of the umbilical veins and putrescence of the navel, as will be shown further on, are generally found in these cases.

(3.) The tuberculous exudation. Tuberculous pericarditis—notwithstanding so many children perish from tuberculosis—is a very rare condition. The tubercles on the pericardium are mostly larger than miliary tubercles in the lungs, and are sometimes found isolated, but sometimes again so close together that they form a rough, hilly membrane, the tuberculous character of which is not perceived at first sight. Macroscopically, however, they are easily recognized by the friability and the greater ease with which they are lacerated than the agglutinated membranes; *microscopically*, by the tuberculous detritus.

Symptoms.—The pathological picture of pericarditis, commonly delineated in the text-books, applies but imperfectly to children, for the phenomena are so variable that, strictly speaking, a description with universally adaptable symptoms must in reality be entirely renounced. They are often very mild, and completely masked by the other concomitant diseases—acute rheumatism, pyæmia, Bright's disease, and tuberculosis; again, they are often very striking, and manifest themselves by great oppression of the chest, severe pain, dyspnœa, rapid pulse, fainting, delirium, and cyanosis. The physical examination always supplies the most important cardinal points.

On inspecting the denuded chest, the heart at the commencement of pericarditis is seen to beat harder than usual against the expanse of the thoracic walls, and occasionally a slight irregularity of the rhythm is already observable. Later, when the exudation increases in amount, and particularly when the fluid part thereof greatly preponderates, the heart becomes displaced toward the left and upward, and will beat correspondingly against the thoracic walls more toward the left and higher up. But if the effusion becomes still greater, then the most characteristic sign comes on, namely, the *heart's impulse can neither be seen nor felt.* The pericarditic friction-sound, when it is heard very loudly and very distinctly, may also at times be discovered by palpation.

Nothing abnormal can be detected by percussion, when the exudation is small in quantity, but, when the effusion is liquid and of a large amount, a dulness over an extensive surface, having the form of a blunt pyramid, the apex of which is directed upward, is obtained. The dulness upward, which may reach as high as the third and even the second costal cartilage, is especially characteristic of this condition, and materially facilitates the diagnosis. It must not be forgotten that very decided pericarditis, in which the exudation is predominantly of the membranous form, cannot be ascertained at all by percussion.

By auscultation, slightly invigorated cardiac sounds are at first distinguished, which occasionally only deviate slightly from the normal rhythm. A friction-sound, however, soon becomes perceptible over one or the other portion of the dulness, which at first may be extremely difficult to differentiate from an endocarditic *bruit;* later on, however, it distinctly manifests itself as a friction-sound. It will resemble, according to its intensity, a slight grazing, rasping, gnashing, or scratching, and is particularly distinguished by the fact that it is usually neither systolic nor dyastolic, but is heard between the two cardiac sounds. It is often very difficult to differentiate it from the endocarditic murmurs, and then it will always be necessary to examine the patients while asleep; and in this connection it may be well to observe that the precaution should be taken to allow them to fall asleep in such garments as can be readily opened in front, and will permit the thorax to be exposed. The main differences are always that the pericarditic friction sound is limited to an extremely narrow space, and never extends as far as the endocarditic murmurs; that it is neither systolic nor diastolic, and that it often vanishes suddenly only to reappear at an adjacent spot, or to remain absent permanently. In consultations this may sometimes be the means of causing different opinions to be entertained in regard to the disease.

In the early stage of the disease the pulse is strong, rapid, and difficult to be compressed; later, it generally becomes small and unrhythmical, and is then easily compressed. In cases of large pericarditic effusions, distinct undulating movements are observed on the jugular veins, and even a bulging of the veins during the systole, and a subsidence during the diastole takes place. At the beginning of the systole the tricuspid valve becomes closed, and the right auricle then dilates; but, since the dilatation, on account of the existing effusion, cannot take place properly, a stagnation of the blood in the vessels consequently results, and a visible distention of the jugular veins is accordingly produced. Catarrh of the bronchi, and, indeed, also, partial compression of the right lung, are almost always associated with this condition.

The functional and general disturbances are extremely variable, as has already been remarked at the commencement of this delineation, and depend much more upon the complications of endocarditis than upon this affection *per se.* Its terminations are either recovery, of course only in rare instances, attended by a sudden disappearance of the friction-sound, or death, which often ensues quickly and unexpectedly, or finally sequelæ, such as universal adhesions of the heart with the pericardium, dilatations of single chambers, disease of the cardiac muscle proper, and, as effects of these processes, manifold disturbances of the circulation.

Treatment.—Acute rheumatism cannot be aborted, probably not even shortened, in its duration; neither calomel, tartar emetic, abstraction of blood, nor the cold-water treatment, produces any marked favorable effect upon it. Under such circumstances, we have no other alternative but to initiate a symptomatic treatment, in which morphine plays the greatest *rôle.* A proper dose of morphine, administered to the patients in some syrup, will procure them the necessary rest; the process, however, is in no way modified by it. The affected joints should be rubbed with olive-oil, and thickly covered with cotton wadding, in order to protect them against all kinds of external violence.

I never treat endocarditis and pericarditis, which complicate acute rheumatism, strictly antiphlogistically; in well-nourished children, a few doses of calomel, at the utmost, may, perhaps, prove beneficial as an antifebrile remedy. Mild counter-irritants, such as sinapisms, dry cups, etc., may prove beneficial. Pyæmic pericarditis of the new-born, of course, always terminates fatally, and, therefore, calls for no special treatment. The consecutive cardiac affection requires an extremely cautious, strict *régime*, as has already been more minutely pointed out in the preceding section, in the treatment of congenital affections of the heart.

(3.) HYDROPERICARDIUM—DROPSY OF THE PERICARDIUM.—Dropsy of the pericardium, alone by itself, occurs only in defects of the heart, where the disturbances of the circulation then manifest themselves earlier on the pericardium than on the pleura and peritonæum. In most instances, however, it is complicated with serous effusions into the aforesaid sacs, and appears as the closing scene of dropsy, with usually a rapidly fatal end. In children, nephritis after scarlatina is almost the only cause of pure dropsies.

Pathological Anatomy.—A light-yellow, clear effusion, varying from one to four ounces, is found in the pericardium, possessing the chemical properties of other serous effusions, i. e., that of a diluted serum of the blood. The pericardium, in contradistinction from purulent pericarditis, is, with the exception of a slight serous infiltration, perfectly intact, neither covered with pseudo-membranes nor abnormally adherent anywhere. The muscular coat of the heart itself, as in all other dropsical effusions, has more of a yellowish than a red color.

Symptoms.—Slight pericarditic effusions cannot be diagnosticated, and, probably, give rise to no symptoms, as the pericardium, even in the physiological state, contains some fluid, and the quantity of this fluid is subject to no inconsiderable variations. In extensive effusions, the symptoms of pericarditis, just sketched, will be distinctly observable. Great oppression, and even orthopnœa, comes on; the jugular veins swell with every systole, and subside again with every diastole. The integument on the well-known places becomes cyanotic and its temperature lowered. As the pure hydropericardium is, in every instance, preceded by dropsies in other parts of the body, and which, perhaps, still exist, its morbid picture is, therefore, materially obscured and obliterated; this is especially applicable to the respiratory disturbances. The physical signs are the same as in pericarditis, only still more pronounced, and easier to be elicited, for these patients are less severely affected in their general condition, and, therefore, are more tranquil than those suffering from pericarditis. The præcordial region bulges slightly, the impulse of the heart is weak, or entirely imperceptible, the pulse is small, the dulness on percussion upward very marked and flat. *One* sign only of pericarditis *never* occurs here, namely, the friction-sound, for its cause, roughened walls, plastered with membranous exudations, never exists here. The terminations of hydropericardium differ according to its cause. Those effusions which supervene upon diseases of the heart always terminate fatally, while those ensuing from scarlatina are capable of being absorbed under proper treatment.

Treatment.—The diuretic treatment, as in all dropsies, is also here the one most indicated, and the pure roob* juniperi, without any kind of vehicle, is tolerated longest and best of all the diuretic remedies. Derivatives upon the alimentary canal should not be tried in this class of patients, because they always disturb the digestion, and a cure of dropsy is only possible when the metamorphosis of the tissues goes on properly. Nor do derivatives upon the skin, by repeated vesications, seem appropriate, on account of the great pain they produce; still less can they be used in children with nephritis, for the cantharides keep the kidneys in a constant state of irritation. Paracentesis of the pericardium, it is true, is recommended, in many works, for the sake of completeness, as a last resource, but, so far as I am aware, has never yet been performed in children's practice.

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* See note to page 223.—Tr.

B.—*ARTERIES AND VEINS.*

Diseases of the arteries never occur in children, and the results of atheromatous affections of the arteries, which are scarcely ever missed in the autopsies of older individuals, are never observed in those of the former. The only condition of which some notice ought to be taken here is, an anomalous termination of the radial arteries, which, in some seriously sick or anæmic children, may be the fault of having caused an unfavorable prognosis to be given. Hence, in cases of remarkable smallness, or complete absence of the radial pulse, it is always necessary to ascertain the condition of other arteries, the carotids and temporal, before a conclusion can be formed upon the fulness or emptiness of the vascular system. The erectile tumors, as a stepping-stone in the study of the diseases of the veins, may find a place here.

(1.) ERECTILE TUMORS (*Nævus Vasculosus*, *Arterial Teleangiectasis*).—**Symptoms.**—By erectile tumors we understand a dilatation of the capillaries, a condition which occurs particularly on the face, eyelids, lips, and neck. This disease of the capillary vessels sometimes affects those of the cutis, sometimes those of the subcutaneous cellular tissue, and then again both, at the same time, to a greater or less extent. In the first case, we have a red elevation of the integument, of the color, and often, also, of the shape of a raspberry; in the latter, a slightly doughy tumor, the integument covering which is either in a perfectly normal condition, or likewise permeated by dilated vessels. Generally, these vascular dilatations are congenital; their growth, however, does not always progress in exact relation to the development of the entire organism, but surpasses it considerably, so that a small teleangiectasis, at birth only of the size of a pin's head, at the end of a year may have attained to that of a pea, or even of a hazel-nut. This fact is universally known; on the other hand, most physicians are not sufficiently aware of the spontaneous termination of these erectile tumors and vascular moles. The general opinion is that, if no operative assistance is rendered, they will continue to grow, and attain to serious dimensions, and yet the reason why they are so rarely met with in adults, and comparatively often in children, has never been satisfactorily explained. The true reason for this circumstance is, that most of them grow smaller spontaneously, and ultimately disappear altogether, although nothing, in the shape of an operative procedure, had been resorted to against them. This spontaneous atrophy, after the manner of infantile cutaneous warts, sufficiently distinguishes nævus vasculosus from malignant neoplasms.

Erectile tumors, the integument of which is almost normal, are easily diagnosticated by the facts that they disappear under the pressure of the finger, become tenser and larger during crying and pressing, sometimes pulsate slightly, and on auscultation allow a buzzing noise to be heard.

Pathological Anatomy.—When such a tumor is cut open on the cadaver, it collapses very much, and gives exit to a tolerable quantity of red serum. On closer investigation it is seen to be composed of merely dilated, excavated capillaries, which freely communicate with each other, and thus present a spongy formation. This is also the reason why erectile tumors are materially reduced in size by compression. If it is still further examined microscopically, there will be found numerous longitudinal and transverse sections of capillaries, and occasionally it has the appearance of small, pouch-like excavations in the vessels, as if the capillaries terminated with bulbous dilatation. Between these vessels perfectly normal connective tissue is seen.

Treatment.—The treatment of cutaneous nævi is different from that of erectile tumors of the subcutaneous cellular tissue. The raspberry-colored spots of the skin on the forehead, eyelids, etc., are best, and in the simplest manner, removed by vaccination. For this purpose the nævus is punctured ten to twenty times with a needle dipped in vaccine matter, when a few drops of blood will always escape, and if nothing further is done the operation will prove entirely fruitless, for the vaccine lymph has oozed out with the blood. But if these punctures are quietly allowed to drain off the blood, then cleansed with a little cold water, and once more covered with a layer of vaccine matter, all, or nearly all of the punctures will take. On the fifth day the nævus displays many elevated bluish-red pustules, which soon become confluent, and begin to dry up by the eighth or ninth day; after the crust has fallen off, a bluish-red cicatrix will at first remain behind, which subsequently fades very much.* If a child that has already been vaccinated comes under treatment for nævus, this procedure, of course, will prove entirely useless; in such a case the nævus may be made to disappear entirely, or, at least, be cut up into single smaller ones, by producing deep, penetrating pustules, by the aid of a plaster composed of one part of tart. stibiat. and three of beeswax, smeared upon a piece of linen and worn for four or six days, at the end of which time small ulcers will have formed, which heal by granulation. The remnants of the nævus may again be covered with the plaster without the least detriment. Large flat nævi may also be made less noticeable by tattooing. Ten or twelve needles are thrust through a small plate of cork-wood, and with this instrument the nævus is punctured all over, after which magnesia usta, or oxide of zinc, is rubbed in the fresh puncture-wounds. From this mixing of red and white a rose-color ensues, which contrasts but slightly with the normal color of the surrounding integument.

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* Dr. Loines informs me that he has cured many nævi by vaccination, and that the phenomena, in the absence of complications by violence, are almost identical with those of ordinary primary infantile vaccination.—Tr.

It is always well to bear in mind, before any intense cauterizations are resorted to with Vienna paste, chloride of zinc, sulphuric acid, etc. —from which large gangrenous ulcerations and disfiguring cicatrices sometimes ensue—that many nævi in time disappear spontaneously, and at the utmost leave behind them a slightly redder-colored spot on the skin, which certainly disfigures less than the large, radiating, contracted eschars that result from the operations. I have established it as a rule for myself, not to treat surgically any cutaneous nævi which cannot easily be surrounded by two curved incisions, and the lips of the wound accurately united through the bloody suture.

The case is totally different with the subcutaneous erectile tumors, which, on the whole, are far more infrequent than teleangiectasis of the cutis. Through spontaneous rupture or slight injuries they may give rise to serious hæmorrhages that may endanger life, and their treatment should not be deferred on that account alone. In some instances it has, indeed, been possible by steady compression to cause such tumors to disappear, but for this method a great deal of time and patience is necessary, and, in addition, the presence of a firm, bony substratum; otherwise the attempt at compression will prove entirely fruitless. Formerly the ligature was principally employed in the removal of these subcutaneous capillary extuberations; a needle armed with a double ligature, or, still better, a narrow tape, was drawn through the base of the tumor, then tied in two sections at opposite points, and allowed to ulcerate its way through; of late, the galvano-caustic has rendered essential service in these cases. For this purpose several platinum wires are introduced into the base of the tumor in opposite directions, at a distance of two or three lines from each other, and brought to a white heat by the aid of the battery, by which coagulation of the blood, suppuration, ulceration, and finally healing, are achieved.

(2.) THROMBI IN THE SINUSES OF THE DURA MATER.—Many investigations have been made in this direction since the time *Virchow* developed and cultivated the study of the formation of thrombi, and the pathological condition in its signification upon the course of the disease has come to be more appreciated. Thus, *Gerhard* found thrombi in the sinuses of the brain seven times in the autopsies of ninety-six children, and all of those seven children died from profuse diarrhœa, attended by cyanosis, coma, and convulsions.

But there is the greatest difficulty in determining the ages of these thrombi. Whether a thrombus has formed before death, in the mortal agonies, or only after death, cannot always be decided. The cardinal points which will lead us to settle this question correctly are, the arrangement of the layers of the thrombi, their central softening, and their adhesion to the walls of the veins; whether they are of a yellow or red color is a matter of no such great importance. It seems, however, that they are not pathognomonic of the atrophy of children, for I have often missed them, and in other cases found red, fresh thrombi, which undoubtedly only originated after death. This condition, therefore, has but slight clinical importance.

CHAPTER IV.

DISEASES OF THE RESPIRATORY ORGANS.

A.—*NASAL CAVITIES.*

As the diseases of the mouth have already been spoken of in connection with those of the digestive apparatus, there remain only for consideration those of the nares. The method of examining the nares is a simple one, and offers but few difficulties, since it is limited entirely to an inspection or exploration, by the aid of a probe or catheter. *Wintrich* has found that the permeability of the nasal passages may be confirmed by percussing the larynx. When, the mouth being closed, percussion is performed over the larynx, the tympanitic percussion-sound that is produced by it becomes dull if one of the nasal openings is closed, and still more decidedly flat when both nares are compressed. Now, if, by the closing and reopening one or both nares, the tympanitic sound does not change in intensity, it may be regarded as proof that the affected nostril is occluded at some point higher up. But this method of examination can only be exercised in old children—those that will close the mouth when ordered to do so, and who willingly allow the nares to be compressed, and the larynx to be percussed. Such children will also snuffle in and out when so ordered, and the permeability of the nasal passages may in this manner be ascertained more conveniently than by percussing the larynx.

(1.) Epistaxis—Bleeding of the Nose.—Epistaxis, as, in fact, all hæmorrhages, is produced by a rupture of vessels; in this case, of the capillaries of the mucous membrane of the nose.

Etiology.—The causes are divisible into local and general. The local are injuries of all kinds, blows, contusions, lacerations, etc. Still, even here, the individual disposition is not to be lost sight of, for the various injuries produce entirely different effects, according to the existing disposition to bleed from the nose. A local causation is also found in the various forms of ulcerations of the mucous membrane. To the general causes, all conditions which are combined with stasis of the venous circulation belong, such as cardiac malformations, goitre, the so-called general plethora, pneumonia, and typhus fever, and particularly the diseases in which actual disturbances of the capillary system of vessels are superinduced, such as scorbutus and morbus maculosus, and diseases of the blood like chlorosis. Finally, vicarious hæmorrhages occur in girls at the time when menstruation should take place.

Symptoms.—The blood either makes its appearance in drops, as stillicidium sanguinis—the ordinary form—or it flows in a continuous stream, rhinorrhagia, a rare and exceptional form. As regards the quantity of blood lost, we are often unintentionally deceived by the relatives, for they forget that the child has bled into a vessel containing water, and, when they behold the dark red-colored water, imagine it to be all blood. Once, in a case of a boy nine years of age, who was reported to me as having daily lost "enormous quantities" of blood, I collected what flowed from his nose during thirty-five minutes (after which time the hæmorrhage ceased spontaneously), not quite one ounce of blood, a quantity that certainly ought to cause no great anxiety.

Children under three or four years very rarely suffer from epistaxis from general causes, but only in consequence of injuries or ulcerations, in which the hæmorrhage is never profuse. In older children all the above-mentioned causes are to be taken into consideration. In children laboring under febrile diseases, it occasionally happens that the blood flows backward into the pharynx and is swallowed, when hæmatemesis may occur, or black, and more or less bloody stools be voided. Usually, the bleeding does not last an hour; in exceptional cases, however, it may be protracted for half a day.

Its pathological signification is naturally very different, according to its severity and etiology. Epistaxis is to be regarded as a favorable phenomenon in all febrile affections, in venous congestion, and in expected menstruation; as unfavorable, and tending to aggravate the condition, in scorbutus and chlorosis.

Treatment.—From the preceding explanation, it follows that the treatment must be exceedingly variable. In scorbutus and chlorosis it must be arrested promptly. When occurring in the other states we have mentioned, the measures to be adopted will depend upon the profuseness of the flow, the frequency of the recurrence of the bleeding, and the more or less anæmic appearance of the child. The best method of arresting the hæmorrhage is to introduce a few bits of ice, of the size of a pea, into the nares, and then to plug these up with a good-sized charpie tampon. The tamponing of the posterior nares through the mouth, by the aid of *Bellocque's* tube, is very annoying to children, and should only be resorted to in extreme cases of scorbutus or chlorosis. Where no ice is to be had, it is very advantageous to dip the tampon in *liq. ferri sesquichlor.* The deligation of the upper and lower extremities, and the keeping of the arms elevated above the head, are popular old remedies.

That the primary causes always deserve a special consideration is, of itself, understood. In order to avoid repetitions, the student is referred, concerning their treatment, to their respective sections.

(2.) CORYZA—RHINITIS—CATARRH.—By coryza a catarrh of the mucous membranes, of one or both nares, is understood, in which affection the mucous membrane always appears reddened and swollen.

Symptoms.—The secretion poured out by the mucous membrane at first is clear and liquid, but after a few days becomes glairy and opaque, until it finally again assumes the properties of the normal nasal mucus. Its reaction is always decidedly alkaline, and the amount of soda it contains may increase so much as to produce a slight corrosive effect upon the upper lip and alæ nasi. These local signs, reddening and erosions, and the inflammation, are intensely aggravated by the constant wiping, which the nursery-maid does not always perform in the most tender manner. So long as the catarrh is limited to the nasal mucous membrane, it is generally unattended with fever, but when it implicates the frontal sinus, or the supramaxillary cavities, conditions which can only be ascertained in older children by inquiries, it becomes febrile, and is accompanied by severe pains in these cavities. When the catarrhal inflammation of the Schneiderian membrane extends to the conjunctiva, through the lachrymal canals, redness, pain, intolerance of light, in short, conjunctivitis catarrhalis, become superadded, and, when finally it passes along through the Eustachian tubes into the tympanum, tinnitus aurium, otitis, and dyscophosis, come on. In other cases, the catarrhal inflammation travels downward into the larynx, causing hoarseness and pain, and from thence into the bronchi, where it terminates in bronchitis capillaris in the pulmonary alveoli; or, lastly, the stomach and intestinal canal become involved, when loss of appetite and vomiting of large quantities of mucus, or slimy diarrhœa, will be superinduced.

In older children, these conditions, even when all the enumerated complications become superadded, are always devoid of danger; but, in the new-born child and nursling, a complete occlusion of the still-narrow nares, by the tumefaction of the mucous membrane and the accumulation of the secretion, rapidly ensues. The usually closed mouth must now be constantly open, its cavity becomes dry, and the breathing loud and rattling. And if these children now attempt to nurse, or take the bottle, they experience great difficulty in breathing, and are obliged to forsake the breast and food, hence their nutrition rapidly suffers, and emaciation supervenes.

Occlusion of the choanæ by thrush-spores also occurs in young children who suffer from thrush of the mouth, causing severe dyspnœa.

Side by side with catarrhal coryza, various cachexiæ manifest themselves in the nasal passages. Thus there is a chronic, scrofulous, syphilitic coryza, and, in very rare instances, a coryza produced by a contagious mucous discharge, in which the secretion is of a totally different nature from simple catarrh; sometimes, even some of the bones are destroyed by necrosis. More will be said about this condition in connection with the respective dyscrasiæ.

Etiology.—Simple nasal catarrh occurs in a sporadic and epidemic form; the epidemic occurrence is induced by undue quantities of ozone in the air, or by mechanical and chemical adulterations of the same; for example, by dust, in the firing up of a stove unused for some time, etc. The liability also to become infectious, by a contaminated breath, is not to be ignored. The sporadic and very chronic cases, as a rule, are of a cachectic nature.

Treatment.—In the ordinary catarrhal form, there is no urgent indication for interference; still it is well to take the precaution to keep the children in a uniform temperature, and to avoid sudden and extreme cooling of the skin, cold affusions, and cold baths. The various abortive treatments that have been tried of late, by injections of solutions of zinc, alum, and morphia, in young children who are unable to blow them out again, and otherwise liable to swallow them, are altogether inadmissible. The nostrils of nurslings, thus occluded by swelling and secretion, must be made permeable by the use of olive-oil, introduced by a small brush at least one inch, and repeated three or four times daily; this procedure will be all the more successful if they sneeze each time, and thus expel the hardened mucous crusts. The cachectic coryza of course does not yield to a local treatment, but must be removed by internal antidyscrasiac remedies. Cod-liver oil is the most effective remedy for the scrofulous form, and a mercurial treatment will be required for the syphilitic.

(3.) ADVENTITIOUS GROWTHS IN THE NOSE.—Polypi are the only morbid growths; they only occur in older children; and with them they are much rarer than in adults. The youngest child in whom I twisted off a fibrous polypus was four years old. By polypi we understand two kinds of tumors, which differ considerably from each other. Soft polypi are cystic gelatinous excrescences upon the mucous membrane; they usually spring from the outer wall of the nares, and, on account of their softness, are called cystic or mucous polypi. The hard polypi do not spring from the mucous membrane, but from the submucous tissue, or from the perichondrium. They consist of connective tissue, are of a rosy-red color, and, on account of their hardness, have been called fibrous or sarcomatous polypi. Both kinds are pediculated, and enlarge themselves into oblong tumors, corresponding to the shape of the nares. The fibrous polypi may attain to so considerable a size, especially backward, as to hang down into the pharynx, and embarrass deglutition and even respiration.

Etiology.—According to the text-books, polypi originate from chronic catarrh. This theory rests upon a feeble foundation, and has many exceptions. Their rare occurrence in children also speaks against it, for in these especially the mucous secretion is much greater, even in the physiological state, than in adults. In the few instances that I have had the opportunity of observing in children, no chronic catarrh preceded them, and no peculiar etiological reason whatever could be discovered.

Symptoms.—So long as the polypi are small, and the nares not blocked up, they seem to give rise to but few, or no embarrassments. But when impermeability of the nasal passages has been produced, then the patients lose the sense of smell, the voice becomes snuffling, the mouth is constantly kept open, giving them a silly appearance, and they are continually but uselessly seeking to free the nasal passage by blowing the nose. Now and then one of these cystic polypi, through the violent snuffling and pressure, will burst, the contents be discharged, and the air once more pass freely through the nares. But, as cystic polypi usually exist in numbers, the smaller ones rapidly follow in growth, occlude the passage anew, and the old condition is reproduced. Firm sarcomatous polypi are also capable of blocking up the lachrymal canal, and the Eustachian tube, and thus produce stillicidium lachrymarum and hardness of hearing. In cystic polypi this is not observed. In both forms, a mucous or purulent coryza, and even ulceration of the mucous membrane, may take place, as a result of which small hæmorrhages also occur. The diagnosis is very easy; ordinarily the polypi reach the margin of the nares, or even protrude. When this is not the case, the impermeability of the cavity in question may be readily ascertained by compressing the opposite one, and causing the patient to blow his nose. From the presence of foreign substances, polypi are distinguished by the slowness of their growth, by slight painfulness, and their chronic course. Cystic polypi very frequently return; fibrous polypi, when thoroughly removed, generally do not.

Treatment.—Internal remedies, as well as the local application of astringents, have proved to be totally useless; the only effectual treatment consists in twisting off and eradicating the polypus, care being taken to grasp it close to its origin, from the mucous membrane. A long, slender, serrated forceps is the best instrument for this purpose.

For the removal of fibrous polypi with broad pedicles, *Middeldorpf's* galvano-caustic is very well adapted. The hæmorrhage produced by the evulsion of the polypus is readily arrested by injections of cold water, and the introducing of pieces of ice. After the removal of cystic polypi, dossils of charpie, smeared with red-precipitate ointment, should be introduced into the nares for several weeks, to prevent its return.

(4.) Foreign Bodies in the Nose.—Children from two to eight years of age very frequently introduce extraneous substances into the nose. The most common are cherry-pits, small round pebbles, glass beads, peas, beans, and paper balls. In addition, insects, such as flies and bugs, gain an entrance into the nose while children are asleep, or a round-worm strays (probably during a fit of vomiting) into the nose. Generally, as soon as a child introduces a foreign body into the nose, it straightway tries to remove it by boring with the finger, and thereby only pushes it into the choanæ, where it finally becomes lodged. The irritation that is produced by these foreign bodies varies according to their composition. If some part of the surface is rough, painful swelling and coryza will soon be induced; beans and peas produce the greatest amount of irritation, they soon swell up in the moist warm cavity, and may even begin to sprout there. A remarkable case of this kind is recorded by *Boyer*, in which a pea germinated in the nose of a child and bore ten or twelve roots, one of which grew to three and a quarter inches in length.

The nose becomes very painful, and, without chloroform, no thorough examination can be made. The termination is most favorable in those instances where paper balls have been introduced into the nose; they soon soften and are discharged piecemeal. However, cases are also said to have occurred in which the foreign bodies produced severe irritation, delirium, meningitis, and death. The condition called rhinolites, in which successive deposits of inorganic salts take place around the foreign body, sometimes met with in the adult, is, so far as I know, unknown in the Pædiatrica.

Treatment.—A painless and yet in many instances a successful remedy is, the act of sneezing, which may be excited by a pinch of snuff, used in the sound nostril. Even when the extraneous body is not entirely expelled, it will nevertheless always be found to have been propelled forward, and somewhat loosened. As soon as it becomes visible, it may be extracted with a very fine dentated forceps or *Daviel's* scoop. Soft bodies may also be crushed with a strong dentated forceps, when the single pieces will soon be expelled. The attempts at extraction should never be persevered in too long, because very severe swelling of the mucous membrane will thereby be produced. They may be repeated again in a few days. Under no circumstances is the nose to be split open hastily, as recommended by *Diffenbach*; the operation should be deferred until critical cerebral symptoms render it necessary, which, on the whole, very rarely occurs.

B.—*LARYNX AND TRACHEA.*

(1.) CROUP (*Laryngitis* and *Tracheitis Maligna*).—It is not easy to find, for one and the same disease, so many and different appellations as for croup. The most current are: *Cynanche trachealis; angina laryngea exudatoria, sive polyposa, sive membranacea, sive strepitosa-perfida-mortalis; laryngea tracheitis exudativa, pharyngo-laryngitis pseudomembranacea; morbus strangulatorius; suffocatio stridula; membranous quinsy.* The shortest of all of these titles, croup, has received the preference, and in the Scotch vernacular properly expresses a white membrane found upon the tip of the tongue of sick chickens, in the disease called "pip."

In ancient times croup seems to have occurred very rarely; for not even one characteristic description can be found in the writings of the old physicians, whose accurate powers of observation no one will presume to question. *Baillou*, in 1576, according to *Fredrich*, is the first who mentions having undertaken a dissection of croup. The literature of croup received a great accession through the proclaimed *concours* of Napoleon I., occasioned by the rapid death of his nephew, the son of the then King of Holland, who fell a victim to this disease in 1807. Eighty-three dissertations on croup were sent in. *Jurine*, of Genf, and *Albers*, of Bremen, received prizes, and many others were honorably mentioned; none, however, knew of any remedy by which the mortality of the disease could in any way be ameliorated. As Napoleon was chiefly concerned about the latter, and not in the enriching of the symptomatology or the pathological anatomy of croup, the writings of the entire *concours* must therefore be regarded as having disappointed him.

Pathological Anatomy.—Croup consists of a certain group of symptoms, which in different individuals always manifest themselves in the same manner. We do not intend to be understood as saying that these symptoms are always indicative of the same anatomo-pathological alterations; on the contrary, there is abundant evidence that it may depend upon *three different* kinds of processes upon the mucous membrane of the larynx. The exudation poured out by the inflamed mucous membrane may be either (*a*) muco-purulent, or (*b*) simply fibrinous, or (*c*) diphtheritic.

(ad *a.*) The laryngeal mucous membrane, which, during life, is probably intensely red and strongly injected, does not generally retain that color after death, but is only slightly reddened; its inflammatory swelling, however, continues, and may be readily demonstrated by a perpendicular incision. This inflammatory thickening is also found in the glottis. The entire larynx and trachea are lined by a tenacious, yellowish mucus, which is with difficulty wiped away. In some places the inflamed mucous membrane displays small catarrhal abrasions, and its follicles are enlarged, so that, when the mucous membrane is rendered tense by bending or twisting the trachea, a minute bead-like drop of grayish-white mucus will rise out from every crypt. This muco-purulent exhalation may extend down into the very smallest bronchi.

(ad *b.*) With the condition just described, which, in fact, must necessarily be found in every dissection of croup, a fibrinous exudation of more or less thickness usually becomes associated, and may be readily peeled off from the inflamed mucous membrane without causing any actual loss of its substance. Microscopically these membranes consist of band-like fibrinous cords, between which numerous pus-cells are deposited. The latter did not originate in the fibrine, but were already previously present upon the mucous membrane, and subsequently became surrounded by the fibrinous exudation, and locked in by the coagulation that ensued. The membranes vary very much in extent. Sometimes very thin, cobweb-like, small patches are found at one or several places of the larynx; in other cases the membranes are of the thickness of the back of a knife, yellowish-white in color, covered on their upper surface by a cream-like coating, and line the entire larynx, trachea, and the bronchi of the higher order, so completely that they appear like a prepared connective, dentritic tubular system, and may be pulled out entire. The tonsils and pharynx are also occasionally seen to be coated with these membranes.

(ad *c.*) In diphtheritic laryngitis a grayish-white exudation into, *not upon*, some portions of the mucous membrane is poured out.

This grayish mass of exudation, beneath which the mucous membrane, as well as the epithelium, is soon destroyed, consists of an amorphous detritus, in which *no bands of fibrine* and but few pus-cells are found. It is not as easily pulled off from the mucous membrane as the simple fibrinous membrane, and generally covers also the palate, tonsils, and pharynx. The distinction between purely fibrinous and diphtheritic croup is entirely a microscopical one.

When the diphtheritic layer becomes detached during life, an ulcer remains behind, the margins and base of which soon become coated with a new grayish deposit. Diphtheria, according to *Virchow's* views, is to be regarded as a progressive inflammation, with partial destruction and sloughing, of the mucous membrane. Diphtheritic laryngitis occurs in an epidemic form, and frequently follows upon morbilli and scarlatina.

The pulmonary parenchyma is found altered in all the three forms. Usually the lungs do not collapse on opening the thorax, because the air in the bronchi is prevented from escaping by the mouth, by the large quantities of bronchial secretion; often diffused pulmonary œdema and very generally lobular, sometimes also lobar pneumonia or tuberculosis, are present.

The adjacent lymphatic glands of the neck and nape, as well as the bronchial glands, are often swollen and hyperæmic.

The rest of the organs, with the exception of venous stasis, exhibit no characteristic morbid changes.

Symptoms.—The prodromata of croup are seldom particularly significant. The children have a cough, sneeze, and suffer loss of appetite for a few days, and sometimes are less lively than usual; still, it also happens that they retire to rest perfectly well and serene, and, after sleeping the first hours of the night, suddenly wake up with a croupy cough, upon which the symptoms may develop themselves so rapidly that the physician who is called in on the following morning finds a complete, well-marked croup. This first stage, the stadium prodromorum, is not noticeable, simply for the reason that, in many cases, it does not occur at all, and, in still more, offers no pathognomonic symptoms whatever.

The commencement of croup is, with justice, dated from the moment in which the first morbid change in the larynx manifests itself through the voice and cough. The voice becomes hoarse and husky, constantly lower and lower, till it finally disappears so completely that their efforts to speak can only be heard in their immediate vicinity.

Even the most intense pain or anger does not enable the child to utter a loud sound. As soon as the voice becomes hoarse and rough, a respiration, audible throughout the room, supervenes. The sounds accompanying the breathing are best imitated by pointing the lips as if about to whistle, but, instead of whistling, you merely inspire and expire through the sharply-pointed lips. A sound is thus produced which is midway between an active breath and a whistle. In croup it approximates more to the active breathing than the whistling tone. The inspirations constantly grow more frequent, and finally the number of respirations may rise to sixty and more in the minute. They also become irregular, sometimes deep, sometimes superficial, and the accessory muscles of the respiratory muscular apparatus participate more and more in every act of respiration.

Simultaneously with the hoarseness and the loud breathing, a cough supervenes, the tone of which is so characteristic that, for brevity, it has been called "croup cough." It is a barking, toneless, dry cough, and has been compared, not inappropriately, to the first attempt at crowing of a young rooster. At first it is tolerably abrupt, and terminates with a single expiration; soon, however, it becomes a regular paroxysm of cough, which may last one and subsequently several minutes. In the first day of croup these severe cough paroxysms are rare, and recur only every four or six hours. Soon, however, they become aggravated in intensity, as well as in frequency, and are quickly induced by the least external irritation, by drink, or pressure on the tongue, for the purpose of examining the throat, etc. They abate, and even disappear altogether, at the approach of death. In consequence of this cough, children become livid in the face, the eyes protrude, staring and congested, from the sockets, the veins of the neck and head swell up into thick tense cords, the forehead becomes covered with perspiration, but the cough, notwithstanding the most violent exertions, remains totally aphonic, accompanied by the expectoration of only small quantities of frothy mucus. These paroxysms of cough are distinguished from those of whooping-cough, which are also interrupted by a whistling inspiration, by their suffocative character, aphonic tone, by the absence of expectorations, and vomiting. Moreover, in pertussis, the child is well immediately after the termination of the paroxysm, and the voice is natural, while croup patients are seriously sick, and the voice is as much aphonic afterward as before.

It is a mistake to ascribe the croupy cough and the loud breathing to true croup only, and to consider all the laryngeal affections in which this cough is heard as genuine croup. To this error, no doubt, a great many of the recoveries from attacks of croup, in which a few leeches or some other therapeutic procedure rendered such "excellent service," are due. Very simple, mild cases of laryngitis often occur in which children have no fever at all, and retain their appetite, but which nevertheless are accompanied by the same hoarseness, the same tone of the cough, and the same loud respirations, for many days together. This condition may even become chronic, may be produced by hypertrophied glands growing around the trachea, and last for many years.

In genuine croup, an increased temperature of the skin is present from the very first, by which, in fact, the general disease manifests itself. The acceleration of the pulse is, in this disease, as in most infantile diseases, of little significance, since even a trifling catarrh will produce it. Croupy cough, hoarseness, and loud respirations, *do not* suffice for a diagnosis of croup; the symptom of *continuous fever* must be present. This consists, above all, in a marked, perceptibly-increased temperature of the skin, in loss of appetite, in augmented thirst, and in acceleration of the pulse.

Concerning the appearances of the mouth, authors of various countries differ according to the countries in which they have carried out their investigations. In France, particularly in Paris, where the diphtheritic croup seems to occur almost exclusively, it is a rare exception to find a child with croup who has not its posterior pharyngeal wall, tonsils, and palate, of a dark-red color, covered with tenacious mucus, and even with diphtheritic exudation. In the many patients with this disease whom I have had to treat in Munich, I have hardly seen a membrane, rarely any thick mucous coating, and only a moderate degree of redness of the posterior parts of the mouth. The case is different again in middle and north Germany, where membranes are often found upon the tonsils, and severer pharyngitis is observed, while English authors consider croupous angina as an exceptional occurrence. The reason for these diverse statements is found in the diversity of the anatomo-pathological process. In the one case, croup is produced simply by a plastic exudation within the larynx, which does not generally extend above the epiglottis; in the other by diphtheritis, which almost always occurs simultaneously upon the tonsils.

Auscultation of the lungs always reveals widely-diffused sonorous râles, but the whistling laryngeal breathing is so intense that it completely obscures the vesicular breathing. If the croup has existed for one or two days, circumscribed or more extensive dulness and bronchial breathing, especially over the back, will also be found, due to lobular or lobar pneumonia. In rachitic children, acquired atelectasis and rachitic carnification of the lungs rapidly increase in circumference, and become surrounded by pneumonic infiltration. The expectoration, as has been already stated, is mostly slight, a frothy white mucus, but occasionally croupous membranes are coughed up during the paroxysms, representing sometimes single patches with fringed borders, sometimes entire closed tubes of greater or less calibre, according to size of the air-tube from which they have been detached. With the expulsion of such membranes, little or but a temporary amelioration takes place, and the prognosis consequently does not improve in the least. This is now a well-established fact, and yet physicians do not cease to torture the poor croupy children with emetics, and triumphantly pull out a membranous piece from the vomited matter, and, when death ensues notwithstanding, as it usually does, "the doctor is supposed, at any rate, to have done his duty."

Slight compression of the larynx generally causes severe pain, while deglutition is only embarrassed and painful when the tonsils and fauces are also implicated, a condition usually not present in this country. The bowels are generally constipated, and the urine is normal, or slightly reduced in quantity.

If the symptoms hitherto depicted have lasted for one, or at the most two days, the effects of embarrassed respiration supervene. The lips, cheeks, and tips of the fingers, become cyanotic, the dyspnœa intense, the child sits upright in bed as long as its strength will allow, and keeps the head extended backward. All the accessory respiratory muscles are in a state of the utmost activity, so that the head, with every inspiration, is made to approximate the chest. With the desperation of deathly fear they tear the clothes from the breast, and pull at the neck as if they would try to remove the cause of their dyspnœa. The little hands, with cramp-like tenacity, grasp at the sides of the cradle, or some other firm object near them, so that the pectoral muscles may the better serve as respiratory muscles. They never remain long in one posture, and, by constantly changing their position, seek to obtain an endurable attitude. The pulse becomes almost uncountable, unrhythmical, and uneven. Several hours before death a remission of all the symptoms usually takes place, the dyspnœa diminishes, yet the respiration remains accelerated, the child again lies down upon the pillow, its expression of extreme anxiety has disappeared, and that of indifference or of unconsciousness has taken its place. The inexperienced parents usually regard this condition as a commencing improvement, but to the physician the clammy cold sweat, the increasing cyanosis, the unequal, uncountable pulse, prognosticate a speedy end.

As regards the explanation of the dyspnœa, and of the paroxysms of cough, it is usually assumed that the former is produced by the croupy membranes, the latter by a spasm of the glottis. But against these suppositions weighty objections appear. The diligent physician, who does not omit to examine every child that dies from croup, knows that the thickness and extent of the croupous membranes do not stand in exact relation to the symptoms observed during life. Where, on account of the most violent dyspnœa, abundant membranous formations are expected, only a few, circumscribed, gauze-thin patches are present; and, conversely, where the croup produced less horrible symptoms, the whole larynx, the entire trachea, and even the bronchi, on dissection, are often seen to be lined with tubular membranes, of the thickness of the back of a knife. Consequently, it seems to depend more upon the degree of the œdematous swelling, which implicates the mucous membrane of the glottis, than upon the membranous formations. The œdema of the glottis, however, almost always escapes the notice of the pathological anatomist, on account of the change of its form that has taken place.

Schlautmann offers valid objections against the theory of spasm. He contends that, in such a kind of inflammation of the mucous membrane, a paralysis of the subjacent muscles takes place as a result of the œdema, and compares croup with the symptoms observed in animals after division of the pneumogastric nerve. When this operation is performed, it also causes the most violent dyspnœa, implicating all the auxiliary respiratory muscles; there is prolonged inspiration, accompanied by a noise, and short expirations. The deep, rough, hoarse tone of the voice, as well as the cough, much more probably indicates paralysis than spasm of the glottis. In the latter condition, the chordæ vocales are in a state of extreme tension, and, consequently, give high tones, not deep, rough ones. Again, in every inspiration, the chink of the glottis is dilated by muscular contraction, but, when this is abolished, it will flap hither and thither, like a loose sail, and exposure of the glottis, after division of the N. vagi, has demonstrated that the paralyzed glottis contracts in every inspiration, particularly when the act is a forced one. Thus the dyspnœa is greater in animals with paralysis of the laryngeal muscles when the animal is stimulated to deep inspirations. The case is similar in children affected with croup. So long as the child can breathe calmly, it is not much annoyed, but, during coughing, crying, and on waking from sleep, when deep inspirations always take place, the paralyzed glottis becomes closed, and the symptoms of the most violent dyspnœa are induced. Thus, then, the older view of spasm of the glottis is tolerably well refuted by this (*Schlautmann's*) statement, and must give place to paralysis, unless further physiological experiments should give this discovery a new signification.

Striking as the symptoms of croup are, still, the diagnosis is by no means easy, and, in this disease more than in any other, both intentional and unintentional errors occur. For the purpose of confirming the diagnosis of true croup, it is requisite that (1) the symptoms of continuous fever, hot, dry skin, rapid pulse, loss of appetite, and mental depression, be present; (2) croup cough, (3) hoarseness, (4) loud, croupy breathing; and (5) suffocative attacks. In this condition, the posterior parts of the mouth need not necessarily be altered, but in diphtheritis they are generally covered with a white, island-like exudation. If any one of the symptoms just enumerated is absent, particularly when the fever is not decidedly pronounced, then we have *no croup* before us, but a simple catarrhal laryngitis, without any dangerous swelling of the mucous membrane, a condition that has been called *pseudo-croup*, which, it is true, after several days, may run into the most complete genuine croup, and terminate in death. This is most probably the form in which, at the autopsy, no membranes, but thick, tenacious mucus, and redness and swelling of the laryngeal mucous membrane, are found; the symptoms during life, however, were not less violent than in the membranous form.

From the lack of harmony between the symptoms and the antomopathological process, it seems to me that it may be justly concluded that croup is no local laryngeal affection, but a general disease, a toxæmia, perhaps, with localization upon the larynx, and that the laryngeal phenomena may stand in about the same relation to the whole disease as the typhous ulcerations to abdominal typhus. A further proof that diphtheria, at least, is no local affection, is derived from the formations of membranes upon a blistered wound on the sternum, for example, when a blister is applied, according to *Luzsinsky's* method, upon such a croupy child. The raw surface will become covered, once or twice daily, with false membrane, which has the greatest resemblance to those diphtheritic depositions upon the laryngeal mucous membrane. And only in this manner is it possible to explain why early and skilfully-performed tracheotomy can be so uniformly fruitless, for the trifling effects of this operative procedure, when practised in other laryngeal affections, cannot possibly be the cause of its total uselessness in croup.

Occurrence and Course.—The diphtheritic croup, which comes on particularly after scarlatina, is markedly contagious, and very frequently attacks several children of one family one after the other. In that form characterized by simple fibrinous depositions this contagiousness is not observed. The latter form occurs most frequently during the prevalence of cold, sharp north and east winds. I have, however, seen it at all times of the year, and under all conditions of the weather.

In this country croup is a rare disease, and the busiest physician meets with it six or, at the most, ten times a year. It, therefore, appears incomprehensible how so many physicians can speak of *epidemics of croup*. To constitute an "epidemic," the sickening of large numbers of persons is certainly necessary, and this is never observed by us as respects croup. The period of life most susceptible to croup extends from the first to the twelfth year, the majority of the patients being between the second and seventh year. In the nursling age it occurs extremely infrequently, and the histories of cases to which no *post-mortem* report is annexed, therefore, merit very little reliance, because it is very easy to confound it with spastic affections of the larynx, so common in this age.

The course of the disease is extraordinarily rapid. The shortest time I have known, from the invasion of the malady till death, was twenty-one hours; the longest, eight days. The termination is almost always fatal. I have never yet seen a child recover from the genuine fibrinous croup, but from the diphtheritic form three children out of twenty or twenty-five have recovered. In these cases, the children did not fully regain their strength till after many weeks; the hoarse voice and barking tone of the cough remained longer than the rest of the symptoms. Nothing could be seen of any expectorated nor vomited membranes, notwithstanding the most careful and constant watching. The symptoms began to subside in from eight to ten days from the beginning of the disease, and passed off gradually; their ability to partake of some lukewarm milk, without being subject to paroxysms of coughing, was slowly regained; the fever abated, the dyspnœa diminished so much that they were able to lie down, and to sleep a few hours at night. The urine was discharged in larger quantities, with copious precipitates of urates. For a long time they remained very pale, emaciated, and debilitated.

I am unable to answer the question, in regard to relapses of croup, from personal experience, for my three recoveries, one of which relapsed, will certainly not allow me to form an authoritative conclusion. The most experienced authors, such as *Valleix* and *Guersant*, express themselves against the possibility of relapses, but *Rost* relates a case, in which genuine croup occurred twice in the same child, and, on both occasions, eventuated in the expulsion of membranes. When some mothers relate that their children have had the croup five and six times, they no doubt announce the result of an intentional or unintentional deception on the part of the attending physician. I once attended the children of a family, the oldest of whom, it was said, had suffered croup six times in early life. Three times the child was treated by the then family physician by venesection, and the other three times by leeches, the cicatrices of which were still visible in large numbers on the neck, and, on every occasion, numerous emetics were administered. The results of this oft-repeated, energetic treatment were—in the case of one of the children, a boy—that he has been very much dwarfed in body, is constantly ailing, and is also very slow in developing his mental faculties. When one of his younger sisters fell sick with croup, as the mother supposed, she sent for me, but, instead of croup, I found only a feverless catarrhal laryngitis, with hoarseness, croup-cough, and croupy breathing. Under a simple treatment, with solution of carbonate of soda (ʒ j to water ℥ iv), a tablespoonful every hour, all the symptoms subsided in a few days. In the course of two years, this affection recurred in this child several times, yet the same treatment was always adopted, with the same favorable result, and the child has not been disturbed in its development in the least. The shrewd mother maintained that the croup-attacks of her older child differed in no respect from those of the younger, except that the former was always a much longer time in recovering from each attack; this difference, as well as defects of development, she no doubt justly attributes to the former methods of treatment.

The *prognosis* in well-declared croup may be set down as fatal. It is most unfavorable in purely fibrinous croup occurring in hitherto healthy, well-developed children. Such children enjoy no advantage over feebler ones in this disease, except that they are often able to resist its destructive force a day or two longer, but they perish just as surely. In diphtheritic croup, especially after measles, a recovery now and then takes place, upon which the treatment, as we will see further on, has no very remarkable influence. Where collapse, cyanosis, and an uncountable pulse have supervened, there speedy death may be prognosticated with certainty.

Treatment.—There is no disease, with the exception of epilepsy perhaps, in which so many remedies and methods have been recommended as in croup. This analogy is not only remarkable in regard to the diversity of the remedial agents, but also in regard to their efficacy in these two diseases.

The older school of the present century, which regarded every patient suffering from an inflammation as lost, unless a large quantity of blood could be extracted, insisted, of course, that in laryngeal croup—the most acute of all inflammations—venesection and leeches should be employed. This was carried out to such an extent that even the jugular vein was advised to be opened, because from it more blood could be obtained, and only the difficulty attending the arrest of the bleeding from it served to prevent this measure from being generally adopted. In phlebotomy, one and a half ounces of blood were counted for every year of life, twice as many leeches were always applied as the child numbered years, and the region of the sternum was preferred to the neck, because on the latter no compression could be exercised, and it might, therefore, be difficult to arrest the hæmorrhage. I am not able to speak of the effects of venesection from my own experience, for I have never seen a child with croup treated in this manner. But it is now discarded as inadmissible, even by the advocates of venesection in general. I have often already noticed the effects of leeches, and must candidly confess that they do decided harm. The patients are very much frightened at them, and strive, with all their might, against their application. As a result, the dyspnœa and suffocative attacks are rather aggravated than diminished, and collapse is generally hurried on. But, if the physician err in the diagnosis, a very possible occurrence in the early stages of the disease, and it is only in this stage that any benefit is claimed for the application of leeches, there is great liability of applying them in cases of laryngeal catarrh. This would be not only a useless application, for the disease gets well without them, but one which would probably materially retard convalescence.

Emetics in croup have always found decided favor with most physicians, although the entertained theories of their action have been as various as the size of the doses and manner of employing them. While some seek a specific effect in remedies which produce emesis —in *tart. emetic.*, in *cup. sulphur.*, and even in ipecacuanha—others regard the act of vomiting, induced by these agents, as the essential result. The advocates of the first doctrine disputed for a long time with each other whether *tart. emetic.*, or *cup. sulph.*, *alum*, or *zinc. sulph.*, were the best remedy; whether the disease must be attacked by larger or minute doses. Under these circumstances, many extravagant, absurd, and protracted therapeutical torturings of children with croup took place. These unfortunate victims of incessant dyspnœa had, therefore, to struggle through the last days of life against an equally unbearable condition, viz., constant nausea, i. e., against an artificially induced sea-sickness. Nauseants, therefore, having proved inefficacious, to continue to administer them in small doses is unjustifiable.

It has also been claimed that it was difficult to make children with croup vomit, and that, therefore, they required larger doses for that purpose. But this supposition has reference only to that stage of croup which precedes the agony of death, in which the pulse is nearly imperceptible, and collapse is supervening. At the invasion, however, of the disease, they will vomit from any emetic like other children, and an infusion of ipecacuanha (ʒ j of the root to ℥ j of water) will induce it. It cannot be denied that the act of vomiting, repeated one to three times, often has a very good effect upon the dyspnœa, by expelling from the larynx loosened membrane and accumulated mucus. Its effect is not curative, of course, for the exudations are usually reproduced, and the former dyspnœa, with all its accompanying symptoms, recurs. And yet, even when no membranes are expelled with the act of vomiting, temporary mitigation of the dyspnœa is nevertheless observed in many instances, so that the act of vomiting seems to have a favorable influence upon the inflammatory swelling of the glottis itself. For the purpose of exciting vomiting once or twice, ipecacuanha answers sufficiently well. The more powerful doses of *tart. emet.* or of *cup. sulph.*, that are given subsequently, it is true, produce more vomiting, but they seldom bring about any amelioration; on the contrary, they lead to rapid collapse. The sweetened infusion of ipecacuanha, which children take without any objection, has the additional advantage that it much less frequently induces diarrhœa than those mineral salts. I generally give such an emetic once or twice as soon as I come to a case of developed croup, but regard it as useless torture to nauseate the patients for any length of time afterward.

For a long time sulphuret of potassium enjoyed the reputation of being a specific against croup, and seems to have become famous mainly through one of the Napoleonic prize competitors, who sent in his work anonymously, having recommended it as the only remedy for croup. But the ineffectualness of this remedy has become apparent in so many cases that it is now altogether abandoned. Its dose was one-half to one grain every hour. Next to the emetics, mercury was the most frequently-used remedy. Blue ointment was rubbed in upon the neck, over a larger or smaller surface of the thorax, and calomel was given in larger or smaller doses internally. When the peculiar action of mercurial preparations is desired to counteract the inflammation of the laryngeal mucous membrane, its use is rational, and the treatment is sustained by manifold analogies; but, when calomel is given in large doses for the mere purpose of accomplishing a derivative action on the bowels, it is more injurious than the neutral salts, or small doses of drastic remedies. Of the few cases which I treated with mercury internally and externally, one recovered. That was a girl, five years of age, but in whom leeches and several emetics were also used, so that this result, as regards mercury, must be stated to be a very uncertain one.

The alkaline carbonates have been long recommended in croup, on account of their solvent properties, which they exercise over all animal substances, consequently also over croup-membranes. *Hellweg*, *Voss*, *Dorfmueller*, *Eggert*, *Hufeland*, and many others, have expressed themselves in their favor, and, lately, *Luzsinsky*, of Vienna, has appeared as a special advocate of carbonate of potassa. He gives two scruples, or one drachm, of this remedy in solution *pro die*, and ascribes to it specific effects. His therapeutic measures consist (1) in neutralizing the morbid admixture of the blood by the potas. carbon.; (2) in overcoming the localization of the inflammation in the larynx, by a blister on the upper part of the sternum, kept in a state of constant suppuration; (3) in moderating the dyspnœa and the cough-paroxysms by opium; and (4) in cauterizing the existing membranes with nitrate of silver, and in causing their expulsion by emetics.

Although I am unable to confirm the specific effects of carbonate of potassa—for, of five children which I treated very scrupulously according to *Luzsinsky's* method, I was only able to save one—still, this method of treatment has much advantage over the older method with leeches and emetics, for by it the children are not tortured, and, to say the least, just as many, and probably more, are saved by it.

The other methods of treatment, with quinine, with large doses of narcotics, by the hydropathic method, etc., each of which has a sufficient number of advocates and detractors, I have not tried, and therefore refrain from giving any decided verdict upon them.

The local treatment has already experienced manifold variations. Some wrap up the neck in dry, others in wet woollen cloths, or in moist sponges, or even in swallows' nests boiled in milk (a famous popular remedy). Others cause the neck to be coated with a layer of fat from all imaginable classes of animals, others again apply various counter-irritants, and still others maintain that the dyspnœa is less severe when neck and breast are entirely uncovered. The French physicians always place great value upon *Bretonneau's* cauterizations of the larynx. For this purpose a proper whalebone rod, with a bit of sponge secured to one end, is made use of. The sponge is dipped in a solution of lunar caustic (℈ss—ʒ j to water ℥ j) and then introduced into the pharynx, the tongue being depressed with a spatula as much as possible. The sponge is allowed to tarry upon the epiglottis, and by a slight pressure some of the solution is squeezed out upon it. No special admonition is necessary about the corroding of the larynx, and the slipping of the sponge into the glottis between the chordæ vocales, because for this purpose a spontaneous deep inspiration is requisite, during which the epiglottis rises high upward, which is hardly possible with the sponge in the mouth. The solution of nitrate of silver has a decidedly favorable effect upon the inflamed mucous membrane wherever it comes in contact with it, causing it, as a rule, to cast off its false membranes in the course of twenty-four hours, and thenceforth it often remains free from further formation. But in genuine fibrinous croup I have seen no effects whatever from the cauterization of the pharyngeal mucous membrane, which indeed is generally unimpaired. Besides the solution of lunar caustic, powdered alum, red precipitate (one part to twelve of sugar), sulphate of copper, and calomel, have also been blown into the pharynx.

The air of the room in which these patients are confined should be pure and moist, and that is best secured by repeated ventilations, and by evaporating water in a shallow vessel.

As a *résumé* of what has already been said, I will here briefly notice the methods of cure advocated by the principal authors, without, however, committing myself to a belief in the efficiency of any individual remedy:

(1.) *Jurine.*—In the first stage, abstraction of blood, according to the character of the attack and the state of the system; after the first abstraction of blood, mild emetics, these to be continued in fractional doses during the second stage (in dyspnœa and suffocative attacks). Should the symptoms grow worse, sinapisms and blisters upon the neck, breast, etc., and moist atmosphere to assist the inspiration. In the second period, emetics in full doses, and subsequently strong expectorants and antispasmodics, according to circumstances.

(2.) *Goelis.*—Leeches, calomel in large doses, inunction of *ung. ciner.* upon the neck and breast; in the interval, *nitre;* early vesications; in dyspnœa, emetics.

(3.) *Hufeland.*—First his linctus emeticus (tart. emet. gr. j, ipecac. powder ʒ j to ℥ ijss mixture). Warm moisture, combined with saltpetre, and clysters of one tablespoonful of wine vinegar. When the dyspnœa becomes aggravated notwithstanding (just what actually occurs uniformly in genuine croup), sulphate of copper in emetic doses, in ¼ gr. doses every two hours, and so on at each exacerbation, inunctions of mercury on the neck, and counter-irritants.

(4.) *Luzsinsky.*—The diagnosis having been determined, a blister at least the size of a silver dollar upon the manub. sterni. Internally *sol. kali carbon.* (ʒ j to water ℥ iv), to be consumed in twenty-four hours. To cover the blister with epispastic paper and keep it suppurating as long as possible. In very severe dyspnœa, small doses of morphine; an emetic during severe suffocative attacks. Cauterization of the pharynx with nitrate of silver.

This last method, with the exception of the blistering, has the great advantage of not torturing the patients, and therefore ought to be preferred to all others. But if after repeated trials it should become manifest that it is totally inefficient, then it would be inhuman to continue it. As a natural result of the ineffectualness of those remedies hitherto used in croup, new ones will probably be constantly tried.

Finally, a few words about tracheotomy. The idea of making a passage for the air through an opening in the trachea in persons who are about to suffocate from obstructions in the larynx, is very old, and as regards its practice in croup it is almost as old as the knowledge of croup itself, for *Home* pointed out this indication as early as 1765. Since that time, the operation has been performed from time to time, but always with unhappy results, so that the prize competitors of 1807 could only mention one successful case, but that was a case in which the diagnosis is said to have been questionable. In 1823 *Bretonneau* again set the operation in motion, and since that time it has been constantly performed and defended by some of the French physicians; but it is necessary to observe here, that the majority of the operations were performed in hospitals for children where contagious diphtheritis prevailed. While many of these croup patients operated upon recovered, it is also true that recovery without tracheotomy often took place. Up to the year 1842, *Trousseau* had operated 119 times, and out of that number obtained 25 recoveries. At this time the principle was advanced that the operation must be performed very early, whereupon the ratio became so favorable that 14 recoveries occurred out of 24 operations. According to another compilation, by *Isambert*, 47 out of 216 cases operated upon recovered, or 22 per cent. This doctrine loses much of its force by the circumstance that the operation must be performed so early in the disease that the practitioner, still less the surgeon, is unable to positively state if the case be one of croup or catarrhal laryngitis. In Germany, it is true, there are a few solitary advocates of the operation, *Roser* and *Passavant*, for example; but the majority of the physicians experienced in the treatment of the diseases of children, and also most of the German surgeons, do *not* perform tracheotomy in croup. In England the opinion is generally against it, and in France a reaction seems to be rising up against it, for *Bouchut* (*Gazette Médicale*, 1858, No. 41) has shown that for every 1,000 inhabitants in Paris, the number of deaths from croup increased from year to year, and was never so great as in the last decennium. In 1853 twice as many children died from croup as in 1837, and, from the years 1847–1858, on an average *five times* as many as in 1838; while, according to a proximative calculation, no such increase of the disease as fivefold has occurred. He lays the blame of this great mortality directly upon the present local treatment, the escharotic, and tracheotomy. The reason why the operation has so little favor with us in Germany, and also in England, is, that we really have few diphtheritic, but mostly genuine fibrinous croup patients.

The operation itself is not attended by any danger to life, and, according to *Trousseau*, is performed in the following manner:

The child is laid upon the table, and under its shoulders a pillow is placed, supporting only the neck, so that the head may hang down a little backward, and the trachea be properly stretched. A longitudinal incision one and a half inches long is now made, commencing at the cricoid cartilage, and carried straight downward. The lips of the wound are retracted with blunt hooks, due attention being paid to the veins, which are also drawn aside by the blunt hooks. After the trachea has been sufficiently exposed, to an extent of three to four cartilages, which are recognized by their white appearance and greater resistance, a blunt-pointed bistoury, the dilator, and the double canula, especially made for tracheotomy, are then got ready. An incision is now made into the trachea, the opening is dilated, and the canula is then introduced by slipping it in between the separated branches of the dilator. After the operator has convinced himself that the air passes through the tube, the dilator may be removed, and the canula is secured by the aid of a tape, and the child, which has suddenly commenced to breathe freely, is allowed to rise.

Of the serious accidents liable to occur during the operation, *Trousseau* mentions, first of all, *hæmorrhage.* Venous hæmorrhage is controlled by simple compression with the finger, and ceases as soon as the canula is introduced; arterial bleeding, of course, must be arrested by the ligature. The anxiety about the blood finding its way into the trachea, on the whole, seems to be somewhat exaggerated, since in patients with hæmoptysis a certain quantity of blood necessarily must remain in the trachea and bronchi, but it generally does not induce any particular suffocative attacks.

Syncope very frequently occurs after the operation, and is produced by the sudden disturbance of the cerebral circulation, in consequence of the respiration having suddenly become free. *Trousseau* once saw it last one hour, but never terminate fatally.

If the respiration does not improve after the operation, the canula will be found to be blocked up with blood coagulæ or pseudo-membranes, which must be removed by means of a forceps made for that purpose.

In the after-treatment, the greatest attention is to be bestowed upon the canula. The wound should be covered with a piece of oiled silk, with a hole in the centre to admit the tube; a second canula is introduced into the first, so that, for the purpose of cleansing, the whole apparatus need not be removed; and a thin cloth is tied around the neck, in order that the air may not come directly in contact with the tracheal mucous membrane, but first be purified from dust by passing through the cloth. The canula should be taken out every three or four hours and cleansed. Once only *Trousseau* was able to remove the canula permanently on the fourth day, several times on the sixth and eighth, generally between the tenth and thirteenth, once not till the forty-second, and once after the fifty-third day. No tracheal fistula ever resulted from the operation.

Children eat and drink immediately after the operation, and without any difficulty. Four or five days later, however, a spasmodic cough comes on every time drink is taken, and part of the liquid is expelled through the canula, a proof that the epiglottis is not able to perform its functions as thoroughly as in the normal state. This condition lasts one or two weeks and then subsides. In serious suffocative attacks, *Trousseau* forbids all liquid nutriments.

So much about the execution of this most unfavorable of all operations, which I, for my part, never insist upon, nor directly oppose when proposed by other physicians, and still less by the parents themselves.

Let us assume that all the children operated on had genuine croup, the ratio of recoveries of twenty-two per cent. is nevertheless an extremely unfavorable one, and especially since the greater portion of the children operated on suffered from the milder diphtheritic form. And if we take into consideration the additional fact that the majority of physicians experienced in children's diseases have abandoned the operation in croup, on the ground that it is a general disease, with localization upon the larynx, we must, it appears to me, discourage its practice generally, and close with the following words from old *Goelis*: "Ad tracheotomiam, omnium remediorum incertissimum confugere res ardua est; parentes abhorrent, aversantur agnati et periclitatur medici fama, quem, infausta si fuerit operatio ac votis illudens, lacrymis multis velut homicidam prolis amatae detestantur parentes."

(2.) Pseudo-croup (*Laryngitis Catarrhalis*).—When an adult contracts a catarrh of the larynx, he becomes hoarse, has a tickling and itching sensation in the larynx, and along with that coughs, but dyspnœa and fits of choking do not occur, as a rule. If a child, on the contrary, falls sick with a simple catarrhal swelling of the laryngeal mucous membrane, violent disturbances of the respiration immediately set in, having their foundation in the narrowness of the chink of the infantile glottis. There seems to be a different relation in the larynx of the child, between the swelling of the mucous membrane and width of the chink of the glottis, from that which exists in the adult. While the glottis of the latter still tolerates a certain degree of catarrhal infiltration, without inducing any very severe dyspnœa, it very often happens that children, who are scarcely noticeably hoarse, are suddenly attacked by fits of suffocation, and for the time present a deceptive similarity to genuine fibrinous croup.

Symptoms.—There is a very simple catarrh of the nose or bronchi, or of both at the same time; the patients are comfortable the whole day through, and eat with the customary appetite, and, aside from a few sneezes and coughs, are in perfect physiological condition. They fall asleep at the proper time, cough perhaps a little during the sleep, or snore in an unusual manner, but suddenly wake up with a well-marked attack of croup. Croupy cough, hoarseness, croupous respiration, and very violent choking-fits, immediately come on, and now no person is able to distinguish this affection from genuine croup. The same anxiety and oppression also supervene; the child rises to a sitting posture, the face becomes red, and the pulse considerably accelerated. These symptoms last for one, or at the longest two hours, and then begin to subside; the breathing and the voice become almost normal, the child lies down again, may call for drink, and then fall asleep, during which a general perspiration breaks out. The physician, who usually arrives at the house about this time, finds a perfectly healthy, sleeping child, who wakes up very indignant at again being disturbed in its night's rest. Two or more attacks seldom take place in one night, but they generally recur in the following nights, and sometimes even after they have been absent for many days or even weeks. Slight hoarseness, a barking cough, and loud snoring during sleep, generally remain after the attack; the temperature of the skin on the hands and forehead may, it is true, be slightly elevated, but actual fever, with general *malaise* and great depression, does not occur. Children thus attacked desire to leave the bed and partake of their meal, although not with a full appetite. Strange to say, no violent attacks ever occur in the daytime; a fact due perhaps to the greater sensibility of the larynx to the masses of mucus accumulating within it during sleep. In the daytime, as soon as this accumulated mucus is of any amount, it excites cough-paroxysms, and is finally coughed out from the larynx into the pharynx, while at night it remains there for a longer time, and then induces violent reflex phenomena.

The entire duration of the affliction is from three to eight days. The usual, indeed almost invariable, termination is in recovery; but cases also occur in which children for many days display distinct catarrhal laryngitis, but finally, under aggravation of the general disease, fall into genuine croup, which generally terminates in death. At the autopsy, membranes are not commonly found in these cases, nothing more than a marked swelling and reddening of the laryngeal mucous membrane, and upon it, as well as upon the tracheal and upon the pharyngeal mucous membrane, a thick coating of tenacious mucus.

Pseudo-croup is very much disposed to relapses, as is often learned from the statements of adults, who claim to have had the disease six and eight times in their youth. It most frequently attacks children in whom the eruption of the last molares is in progress, but does not, however, spare older ones; while in small children, who still labor under the effects of cutting the incisor teeth, the spasmodic form of laryngeal affection, without any catarrh, is the most frequent variety. Moreover, there are also transitory forms in which it is very difficult to decide whether we have to deal with a simple spasm of the glottis or pseudo-croup. Only the hoarseness of the voice and the croup-tone of the cough in the intervals allow the diagnosis for this or that form to be established with certainty, for these symptoms never occur in pure spasms of the glottis. Pseudo-croup is also distinguished from genuine croup by its intermittent character. Although in the former the voice in the daytime is hoarse, and the cough affected with a croupy clang, still the fever and the general affection will never awaken any special anxiety; the children get up, are lively, amuse themselves with their playthings, and even partake of some nutriments. But from all this the case is totally the reverse in genuine croup, and the laryngeal symptoms are always much more pronounced.

Treatment.—Pseudo-croup should never be regarded slightingly even in its mildest form; for very gradual transitions into the genuine croup happen, and, after the fatal termination of which, we may, when too late, regret having carelessly treated the first hoarseness. Children thus affected are to be kept in a perfectly uniform temperature; the neck should be wrapped up, and they should be confined to a milk diet and plain soups. Moist compresses to the neck, when properly applied, act very favorably. The compress should be no wider than a narrow cravat, covered by a piece of gutta-percha, and these confined around the neck by a second dry cloth in such a manner that the water will not run down upon the body, and cause a too rapid evaporation and partial cooling of the neck, by which the hoarseness generally becomes aggravated. This danger on the one hand, and the conviction that the wet cravat is not always absolutely necessary, have induced me to discard it altogether where a special and experienced nurse does not undertake the care of the child. Internally, I generally give kali carb. (℈ss—℈j to water ℥iv), and allow the patients to drink as much as possible, because experience has proven that, by promoting diuresis and diaphoresis, a mitigation of the catarrhal secretion of the respiratory mucous membrane is produced. It will seldom be necessary to resort to emetics.

(3.) Neurosis of the Larynx. — Motor disturbances of the laryngeal muscles frequently and almost exclusively occur in childhood. Both forms, the spasm and paralysis, are observed, but the former is much more frequent than the latter. It must be premised that, as a rule, all those laryngeal affections must be excluded in which any symptom of material lesions of the mucous membrane can be detected; for, since the muscles of the larynx must by such lesion become altered, a change of the voice follows, as well as a change in the manner of breathing, and in the cough. These exclusions having been disposed of, the neuroses remain. In slighter deviations from the normal construction, which, in the cadaver, presents a pathologically altered mucous membrane, it is often difficult to decide whether death resulted from a pure neurosis, or from a swelling of the mucous membrane, or an œdema of the glottis.

(a.) *Spasmus Glottidis.*—That the glottis may become spasmodically contracted is no longer any subject of doubt. This may be demonstrated experimentally by vivisections, and is anatomically confirmed by the insertions of the muscles of the larynx. These muscles are supplied by the recurrent laryngeal nerve, and are (1), the thyro-arytænoidei; (2), the cricoarytænoidei laterales; and (3), the arytænoideus transversus.

An acute and a chronic form may be distinguished. There are spasms of the glottis in which death ensues, after the first few paroxysms, by choking or suffocation, and others again which last for months, and may relapse after very long pauses. The writers of the preceding and of the present century record no precise reports concerning this condition, but differ remarkably from each other in their views upon it, and consequently have invented a number of names, most of which are based upon etiological views, causing the greatest confusion in the minds of those physicians who do not rely upon their own investigations. Thus there was an asthma acutum et chronicum Millari, the symptoms of which, however, are more applicable to our own pseudo-croup than to a pure spasmus glottidis—an asthma thymico-cyanoticum—a suffocatio stridula—an angina stridula—apnœa infantum—catalepsis pulmonum (Hufeland)—a laryngismus stridulus—phreno-glottismus—laryngo-spasmus infantilis—tetanus apnoicus infantum—and finally even a cerebral croup, by which the English, especially *Clark*, understood a species of croup, at the autopsy of which the larynx was found unaffected, and which, of course, was always ascribed to a cerebral disease that was not demonstrable.

Symptoms.—The following morbid picture may be delineated in general outlines. Usually very healthy, robust children are seized during the process of dentition with a suffocative attack. All at once the face becomes strongly injected, the head is thrown backward, the mouth is slightly open, or makes snapping movements; the extremities are stiff, or hang down powerless; the child also plucks at its neck, as if it would tear away the cause of its strangulation. Finally, after a most tormenting struggle of a half to one minute, a few short, abrupt whistling inspirations follow, with which no expirations alternate, and then the whole fit is either at an end, and the normal respiration inducted again by a prolonged whistling expiration, or another suffocative attack, with totally arrested respiration, begins. This entire phenomenon may recur several times in succession, so that the child does not return to normal or much improved respiration for several minutes. The paroxysms occur as often in the daytime as in the night, and may return forty times in the twenty-four hours; they are especially induced by deep inspirations. If the disease has existed for a certain time, general convulsions will become superadded to the spasm of the glottis—a condition which has been described by some authors as the second stadium.

If we are to analyze the individual symptoms more accurately, it will be necessary to classify them first into two groups: (1), as to the symptoms during the attack, and (2), the symptoms in the intervals.

(ad 1.) The tone which accompanies the first inspiration after the suffocating fit, and at the beginning of the cataleptiform state, popularly called "Ausbleiben" in German, is always very characteristic. It is a crowing, whistling cry (the crowing inspiration of the English), and is tolerably accurately imitated by executing a sipping inspiration through the almost-closed chink of the glottis, while at the same time attempting to utter the vowel *i*. Sometimes this cataleptic state is also ushered in by a few of these inspirations, but, in most instances, the children have not the time for that, and, as if strangled, gasp voicelessly for air, along with which they become livid, and throw the head backward, in order to dilate the chink of the glottis as much as possible. Immediately after the attack, the expirations are superficial and apprehensive, but soon become perfectly normal, and free from the whistling noise heard in croupy breathing.

The superaddition of general convulsions to *spasmus glottidis* (second stadium), as relates to prognosis, is very important. The thumbs are now drawn in toward the palms, the forearms strongly pronated, and all the adductors of the upper extremities affected with spasmodic contractions. The feet, on the contrary, are rigidly extended, the great toes abducted and drawn upward. The muscles of the face are thrown into convulsive action, and opisthotonos may appear. The temperature of the extremities is much more likely to be diminished than increased. These general convulsions plainly depend upon those of the glottis, for they appear and disappear with them.

During the paroxysm, the face, of course, becomes flushed and even cyanotic. The congested eyeballs protrude from their cavities, the tongue becomes bluish-red, and the veins of the neck distended, and the face is stamped with the expression of the utmost anxiety. During the attack itself it is very difficult to feel the pulse, or to distinguish by auscultation the sounds of the heart. Indeed, such an examination, at a moment of so great danger to life, is not only useless, but improper and cruel, and should not be practised at such expense of most precious time. Several minutes after the paroxysm the pulse is still distinctly felt to be unrhythmical and irregular. The fæces, and less frequently the urine, are passed involuntarily during the paroxysm.

(ad 2.) The symptoms during the intervals are different, according to the severity and the duration of the paroxysms. Most children, during the interval, are tired and petulant, but in the mild cases appetite and sleep are enjoyed. In those instances where the spasms are intense and frequently repeated, the child loses its appetite, becomes emaciated, and suffers more or less fever.

Duration, Course, and Prognosis.—The duration of this disease cannot be fixed at any given time. Sometimes even the very first attack terminates in death, and a seemingly perfectly healthy child may be carried off in a few seconds. Others may suffer for months, periodically, as often as a tooth breaks through, from a crowing, whistling inspiration, not, however, from total closure of the glottis, and its extreme symptoms, as the normal respirations recur after a few seconds. In most cases, the disease runs through a certain circuit, in which an aggravation, a climax, and a diminution, can be recognized. At first the attacks are rare, recurring every eight or fourteen days, but in the process of time they become more frequent, finally occur several times daily, and increase in intensity. Before this climax has been reached, six to eight weeks generally pass away. The children either perish in a fit, or, when this acme has lasted for from eight to fourteen days, are attacked by fever and become emaciated. A lobular pneumonia or a profuse intestinal catarrh may come on, and result in death. Recovery, unfortunately, happens very seldom when the disease has once passed beyond a certain grade of severity. In the favorable case, the paroxysms remit in frequency and finally cease altogether. But the child remains very backward in its development, is always pale, rachitic, and predisposed to relapses, which, however, seldom terminate unfavorably. Out of fifteen cases of which I have kept a record, eight died. *Rilliet* and *Barthez*, out of nine cases, and *Herard* out of seven, observed in each only one single instance of recovery. It may be safely assumed that this relative mortality had turned out rather too unfavorable, since only the serious cases under the care and watchful eye of the physician are taken into account; and the milder forms, which gave the physician but little trouble, and caused the parents no great anxiety, are probably not mentioned.

The prognosis depends upon the frequency and intensity of the attacks, upon the complication, and upon the comparative development of the child. Children at the breast recover oftenest; thin, emaciated children, and those inclined to atrophy, very rarely. The more developed and extensive the craniotabes is, the more unfavorable is the prognosis; the connection between it and spasm of the glottis will be more thoroughly discussed in the following section.

Etiology.—We have to discriminate between the causes which give rise to, or favor the single paroxysms, and the general exciting causes which are particularly predisposing to the disease.

To the first belongs fright. A loud, suddenly-produced noise suffices to induce a spasm of the glottis. It may also be produced by depressing the tongue in the examination of the mouth, by the acts of deglutition, by coughing, and by crying. But the closure of the glottis brought about by crying should be carefully distinguished from that cataleptic state into which very choleric and somewhat older children, from two to four years of age, are *voluntarily* able to work themselves. There are very many, chiefly badly-brought-up, spoiled children, who at the slightest provocation throw themselves into violent paroxysms of crying, and exert themselves so forcibly that they are for a moment unable to draw their breath, and for an instant become livid or even bluish-red in the face, and then begin their cry anew with a whistling, prolonged inspiration. This kind of voluntary unconsciousness is by no means dangerous, and there is no reason at all why the will of such children should be humored in order to avoid this condition. The most rapid psychological method of treating it is, to dash a glassful of cold water at once into the face.

When the disease reaches its climax, it will require no active cause to induce a paroxysm. Then the attacks come on during the calmest sleep, under the quietest circumstances, and at any time, without the least exciting provocation.

By analyzing the *general causes*, very peculiar phenomena are elucidated. First of all, as regards the sex, spasmus glottidis attacks boys much oftener than girls; a fact almost all authors admit. Out of my fifteen cases, eleven were boys, so that it seems as if the larynx of male children begins even in the very earliest youth to distinguish itself in form, or at least in physiological activity, from that of female children.

The *age* at which the disease occurs fluctuates between one half and three years; that is to say, it makes its appearance with the eruption of the first tooth, and disappears with that of the last. It occurs much oftener with the cutting of the incisor teeth, in the first half year of life, than with that of the canine and molar teeth. The thought constantly suggests itself, whether a direct extension of the reddening and swelling of the mucous membrane, as a result of dentition, to the larynx, might not be assumed. In that event, however, spasm of the glottis would be most sure to occur where the local troubles of dentition are most perfectly pronounced. But this, according to my observation, is by no means the case. In most of these children I found the mouth not particularly reddened, and without profuse secretion.

The *hereditary character* of spasm of the glottis is interesting. There are families in which all the children suffer more or less from it, and *Powell* even relates an instance where, out of thirteen children, brought up by the same parents, only one escaped the disease. The mothers of the children whom I have treated for this disease were all of a tolerably excitable nature, and often complicated the child's disease by indulging in their habitual hysterical outbursts.

The connection between *craniotabes* and spasmus glottidis (tetanus apnoicus) has been satisfactorily demonstrated by *Elsässer*, the discoverer of the soft occiput. Not the softness and depressibility of the occiput *per se*, but their *effects*, should be regarded as the exciting causes, as the meninges may thereby degenerate into an abnormally-congested condition; true plastic exudations are not generally found in children who died from this disease. The discovery of the relation between these two diseases by *Elsässer* was subsequently fully confirmed by many authors, especially *Lederer*, and cases have even been recorded in which spasm of the glottis could be voluntarily induced by pressure on the softened places of the rachitic occiput. Without doubting altogether this mechanical cause, it can, nevertheless, only be regarded as an exceptional one; for, if it had a general applicability, then the paroxysms ought to come on oftenest during sleep, when children lie with the occiput pressing the pillow, than in the waking state, when they are mostly carried about upright. But exactly the contrary is the case. The hyperæmes of the brain, and of its membranes, upon which *Elsässer* lays a particular amount of stress, are much more probably the effect than the cause of the disease, and when, *ex juvantibus et nocentibus*, a conclusion might be made upon the nature of a disease, then they stand in no causal connection at all with the spasms, because otherwise these should be cured or palliated by local abstraction of blood, and by a derivative action upon the bowels, a result well known to be impossible of achievement by these means. We must therefore limit ourselves to admitting the remarkably frequent concomitance of spasmus glottidis with craniotabes, as irrefutable facts, but require further physiological and anatomo-pathological investigations, for the conclusive proof as to cause and effect.

Disturbances of the digestion may likewise produce spasms of the glottis, as may be readily inferred from the fact that a sensible regulation of the diet, and abstaining from nutriments difficult to be digested, bring about a speedy improvement; while all treatment is fruitless so long as the digestion is attended by flatulence or diarrhœa, or other disorder. Children at the breast are extremely rarely affected by this disease; and, of the artificially-fed children, mainly those who do not properly digest the immoderate quantities of food allowed them suffer. That the children of affluent parents are totally spared by this affliction, as *Rilliet* has observed, in Genf, cannot be maintained by us in Munich. The children of poor people do, indeed, oftener fall sick with it, but it should not be forgotten that in all cities there are more of these than of rich.

Finally, *Kopp*, and, after him, a great number of physicians, assumed the *thymus gland* to be a cause, and, indeed, the only one, so that the description of "Asthma-thymicum Koppii" is even used at the present day by some of the older physicians. But pathological anatomy has overthrown this theory. A large thymus gland has often been found in the cadavers of children who have died from totally different diseases, and never suffered from spasm of the glottis; and, conversely, in many cases where this was the cause of death, a normal, and even an atrophied thymus was observed. Hence, it seems that we must discard asthma-thymicum altogether, as a denomination of a disease.

Pathological Anatomy.—So far as the larynx itself is concerned, the morbid appearance is invariably of a negative character, and thus the spasmodic nature of the disease is also confirmed by the *post-mortem* examination. The rest of the appearances are not constant, and consequently not characteristic. Rachitis is most frequently found and most extensively marked upon the occiput, and next in frequency on the ribs. The thymus gland is sometimes large, sometimes small, and at times undergoing complete absorption. In the intestines, solitary glandular indurations are sometimes found; in the bronchi, catarrh, and, in the lungs, tuberculosis may also have appeared. The bronchial glands, in particular, are degenerated into large, cheesy tubercles. Hypertrophy and an injected state of the meninges are frequent morbid appearances. By some investigators the pneumogastric nerves have been found hardened, by others again soft.

Treatment.—(a.) *Prophylaxis.*—When one or several children of a family have already perished by spasm of the glottis, the parents are naturally in a state of constant fear that they may also lose those subsequently attacked, and therefore declare themselves ready for any sacrifice by which this calamity might possibly be averted. In this respect the country air is particularly recommended, but it must be remarked that it is only useful during the few summer months, when children may actually be taken out into the free air, and that the mothers, in such cases, are very averse to parting with their family physician; and, lastly, residence in the country by no means supplies a positive guarantee against the appearance of the spasms. I myself have twice been taken to the country to see children with spasm of the glottis, who were born there, and had never yet been in the city. Hence it seems more advantageous to leave the children in the house of the parents, and under the care of the regular family physician, where they can enjoy fresh air several hours daily in some neighboring park. Such children should be kept as long as possible at the mother's breast, at least till they have cut the first six incisors. The supervention of the occipital rachitis is sought to be averted by zealous ventilation of the room, by keeping the head cool, bathing it with water, and by aromatic baths. All sorts of digestive disturbances should be remedied as quickly as possible by small doses of alkaline carbonates, to which a little rhubarb may be added, when constipation is present.

(b.) *Treatment of the Attack.*—One minute is but a short time for the selection and application of a remedy, and it is altogether incomprehensible how some physicians would have us treat the *attack* with sinapisms, emetics, clysters of various kinds, and with warm baths, the preparation of which certainly requires a much longer time. The first thing to be done is to raise up the child, and throw the head backward, so as to give the larynx the most favorable attitude, and to remove all the tight clothes from the chest as quickly as possible. In the instances where I happened to be present at the paroxysms, I introduced the index-finger into the mouth, carried it to the posterior pharyngeal wall, elevated the epiglottis, and then touched the chordæ vocales, by which marked acts of choking were instantly induced, and then the well-known whistling inspiration followed. Lay people, of course, are unable to execute these manœuvres, and I therefore content myself by showing them how retchings may invariably be induced by pressure upon the root of the tongue. The shock produced by inducing this act of retching is the only harmless remedy which will cut short the paroxysm. From affusions with cold water, and from the forcible to-and-fro swinging in the air, very much in vogue with the nurses, I have seen no decided effects; chloroform is very urgently recommended by many physicians, especially by *Cox* and *Smage.* It seems to me, however, to be too dangerous an agent to be left to the use of the lay attendant. Tracheotomy, which has been suggested as a *dernier ressort*, with which to save the life of the child, can never be performed, on account of want of time.

(c.) *Causal Treatment.*—Such a list of remedies, for the subjugation of the developed spasm of the glottis, has been recommended, that the very number alone must excite mistrust. Those still in greatest favor are: *oxide of zinc* in grs. ii—x pro die, *argent. nit.*, gr. $\frac{1}{8}$—$\frac{1}{2}$ pro die, *ammoniate of copper*, *asafœtida*, *tr. moschata*, *aq. amygdal. amar.*, *belladonna*, *hyoscyamus*, *opium*, *cannabis indica*, five drops every hour, and small doses of *calomel.* All of these remedies are uncertain, and have no specific effects whatever, for the majority of children perish notwithstanding the kind of treatment and remedies used. There is but one remedy by which the rachitis can be positively brought to a stand-still, and that is the raw, strongly-rancid cod-liver oil, and if the frequent concomitance of rachitis of the skull with spasm of the glottis is not lost sight of, then this agent has yet the greatest claim to a *rational* method of treatment. In fact, I have already seen three children recover by the use of *ol. jecoris.* It is to be regretted that it is very often not tolerated by the stomach, producing gastricismus and vomiting, on account of which, of course, it has to be discontinued.*

Scarification of the gums, which the English make various uses of, has found but little favor with us. In one child, in whom the two bicuspids were very nearly through, I performed it very energetically, but without the least effect. The paroxysms occurred oftener and oftener, constantly grew more and more violent, and the child succumbed, although the swollen gums had been completely removed, and the sharp edges of the teeth were plainly visible.

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* Hillier and B. F. Dawson give bromide of potassium, and claim to have seen good effects from it.—Tr.

Combined with the internal administration of *ol. jecoris*, I have lately kept two children constantly in a mild camphor-atmosphere, by suspending from their necks bits of camphor loosely tied up in a rag. Both children recovered; whether this camphor-atmosphere contributed any thing thereto, more extensive trials may determine.

(b.) *Paralysis Glottidis.*—Paralysis of the glottis is a rare affection. This may appear remarkable, since tumors grow so frequently about the neck, and are liable to exercise pressure upon the vagus and recurrent laryngeal nerves, and thus produce paralysis of the laryngeal muscles. In vivisections after division of the recurrent laryngeal nerves, the glottis is seen neither to dilate during inspiration nor to contract during expiration; but in a very deep inspiration it mechanically becomes narrowed or closed, as the strong current of air gives to the chordæ vocales the form of two segments of a wheel, and their borders are thereby made to approximate, or even to touch each other, and thus be converted into valves. Paralysis of the glottis, resulting from disease of the central nervous system, is observed in most of the dying, and in very rare instances may also be caused by tumors, by large tubercles, or by carcinoma, existing at the base of the brain, a long time before death. Peripheral paralysis of the glottis originates through pressure upon the cervical portion of the pneumogastric, or upon the recurrent laryngeal nerve, which alone, according to the united investigations of *Volkmann*, *Longet*, etc., may give rise to dilatation, as well as to closure of the glottis. The pressure, as a rule, is caused by scrofulous enlargement of the lymphatic glands, lying in the course of the vagus, in which, at the autopsy, this and the recurrent nerves are found embedded and flattened. This fact furnishes a means of explaining the violent paroxysms of dyspnœa that sometimes occur in scrofulous children, in whom the external glandular swellings are often so insignificant that a dyspnœa, induced by their pressure directly, is altogether out of the question.

Symptoms.—The principal symptom is an uninterrupted, labored, rattling respiration, which, at every deep inspiration induced by crying, laughing, and strong exertions, terminates in a paroxysm of cough.

The respiratory sound is as loud as in croup, but is distinguished from croupy breathing by the less shrill and more rattling tone, and, in addition, by the ordinarily very slight dyspnœa, which, however, during the cough-paroxysms becomes more marked, and is often aggravated into an orthopnœa. This condition is always chronic, and, when no other afflictions are accidentally present, not attended by fever. The voice here is rough, hoarse, and even complete aphonia may exist.

The duration of this affection cannot be foretold. On one occasion I saw it disappear spontaneously, although the glandular swelling visibly increased in size. It is presumed that a softening or absorption of the deeper portions of the gland took place, and thus relieved the pressure. Generally, the prognosis is unfavorable, a diffused bronchitis soon supervenes, and not unfrequently pulmonary tuberculosis, which in a short time carry off the patient.

Treatment.—As scrofula is almost always at the bottom of this affection, an antiscrofulous treatment will, therefore, be absolutely indicated. Cod-liver oil is decidedly the best remedy for it; locally, painting with iodine, repeated two or three times every week, most rapidly effects a diminution of the glands. If, in this manner, we do not succeed in removing or at least in mitigating the evil in from eight to fourteen days, it will be absolutely necessary to extirpate the affected glands. The effects which the hypertrophied glands produce show conclusively that they extend deeply down, and this operation should, therefore, only be undertaken by a skilful operator, well versed in the anatomy of the parts.

C.—*THYROID GLAND.*

If we exclude the extraordinarily rare thyroiditis inflammatoria, and traumatica, which may occur as the effects of external injuries, such as from throttling, contusion, etc., there will only remain for consideration the various kinds of hypertrophy of the thyroid gland.

STRUMA.—By struma we understand all kinds of enlargement of the thyroid gland. Sometimes the increase in size is only transient; generally, however, it is permanent, and constantly progresses. Either the whole gland hypertrophies, or only a single lobe or a small section of a lobe, and the symptoms of compression vary according to the direction in which the enlargement progresses. When the gland enlarges outwardly and anteriorly, the integument covering it will become gradually distended, and, with the exception of the unsightly disfigurement, no further disturbance of the functions of the adjacent organs will ensue. But if it becomes enlarged backwardly and laterally, the sterno-cleido-mastoidei muscle and the large vessels and nerves of the neck will be displaced, and manifold disturbances of the circulation and innervation supervene. With these, serious embarrassments of deglutition and of respiration become associated. When, for example, and fortunately very rarely, it happens that the strumous gland surrounds the œsophagus and trachea like a ring, the symptoms assume a very serious aspect; and when the lower border of the gland enlarges in length, growing downward beneath the manubrium sterni, it hypertrophies in every direction.

The enlargement of the gland takes place in two ways. Either the granules or cells of the normal gland become developed in greater numbers, and thus produce a perfectly normal glandular substance, but hypertrophied in volume (struma lymphatica), or a few thyroideal granules become enlarged into extensive cysts, which even in children a few years old may attain to a diameter of one inch and more (struma cystica). The contents of these cysts are a semi-consistent, gluey, yellow, or brown liquid, for which the name of colloid has been invented. In goitre of children the walls of the cyst are invariably attenuated and soft, while in older individuals they are well known to be markedly thickened, and have even been found to have undergone ossification. The cystic goitre has a nodular and uneven feel; large cysts fluctuate distinctly; lymphatic goitres never display any globular distention, and have a uniform consistence in every direction.

Infants occasionally come into the world with congenital lymphatic struma, they are liable to be semi-asphyxiated, and are only with the greatest difficulty brought to life, and, even after that, they breathe loud and laboriously. This goitre of the new-born child disappears spontaneously in a remarkable manner after several weeks. Usually, however, older children, girls particularly often, are affected by it after commencing the second dentition, and here the lymphatic struma is as frequently met with as the cystic. In children the above-mentioned serious symptoms from displacement of and pressure upon the organs of the neck, and of compression of the trachea beneath the sternum, are, on the whole, extremely rare; usually medical assistance is only sought on account of the unsightly appearance.

Treatment.—Surgical interference, on account of the dangers attending upon the extirpation of goitres, and even upon simple punctures and injection of the cysts, is only admissible when the symptoms are of the most urgent kind; no operative procedure should be undertaken solely on account of the disfigurement. Lymphatic struma uniformly disappears under the external use of iodine repeated six to twelve times, at from three to six days' intervals. Cystic goitre does not disappear under this treatment, but becomes visibly smaller, or at any rate does not grow larger, so that, with the increasing size of the body, the deformity becomes less striking. Tincture of iodine acts remarkably quick and surer than the compound iodine ointment, and on that account I never use the latter.

D.—*THYMUS GLAND.*

As the anatomy and physiology of the thymus gland have already been discussed on page 3, there only remain to be mentioned the few pathological appearances which in rare instances occur in it.

As regards *asthma thymicum*, it has already been stated, in the section on *spasmus glottidis*, that the size and position of the thymus gland probably have no influence whatever upon the spasms of the glottis, for in many autopsies the gland has often been found large, and then again small. But the name *asthma thymicum Koppii* is doubly incorrect: (1), because the thymus has nothing to do with the asthma; and (2), because long before *Kopp*, who published his work in 1829, the greatest authorities, such as *Morgagni*, *P. Frank*, *Allan Burns*, etc., sought to establish the view that the thymus may produce suffocative attacks.

In new-born and in still-born children *F. Weber* found small hæmorrhages into the parenchyma of the thymus. They have been observed singly and in multitudes, associated with intense hyperæmia of the entire organ, and generally do not attain to a size larger than a pin's head. Usually ecchymoses are also found in the other organs. *Weber* attributes all these extravasations to the act of delivery *per se*, and states that they are only absent in rare cases, as, for example, where a small child was delivered from a large pelvis dead, from any cause which could not be ascribed to the circumstances of pressure.

Tuberculosis of the gland not infrequently occurs; and even the large genuine tuberculous masses, which generally have their site in the bronchial glands, have been seen in the thymus gland, while the former were free.

I have twice found carcinoma of the mediastinum anticum in boys five or six years old, the lungs, in both cases, being but very little implicated; the pleuræ and pericardium were also free, and therefore it appeared most probable that the disease originated from the thymus gland.

Affections of the thymus gland, with the exception of carcinoma of the mediastinum anticum, which may be detected by extensive dulness over the anterior half of the chest, and manifests itself by pressure upon the heart, large blood-vessels, and the lungs, cannot be diagnosticated; for the mere existence of dulness on percussion in the region of the sternum by no means allows a conclusion to be formed as to the state of the gland. For these anatomo-pathological alterations, the symptoms of which are so obscure during life as to preclude a diagnosis, no treatment, of course, can be prescribed.

E.—*LUNGS.*

(1.) BRONCHIAL CATARRH (*Catarrhus Bronchialis Acutus, Chronicus*). *Bronchitis.*—In the physiological condition all mucous membranes are covered with a certain amount of secretion, essential to the functions of mucous membranes. Now, the bronchial mucous membrane likewise secretes a certain quantity of mucus, and in fact just as much as will suffice to prevent its becoming dry. Every hyperæmia of the membrane causes an augmentation of the secretion; more is poured out than can be evaporated, and the consequence of this is an accumulation of mucus in the bronchi, which condition has been denominated bronchial catarrh, or, in severer forms, bronchitis.

Pathological Anatomy.—Bronchial catarrh may occur either in the bronchi of the first and second order alone, the smaller remaining unaffected, or conversely; the principal morbid alterations are found in these, while the large bronchi remain normal, or finally the bronchi of all orders may be uniformly affected. Both lungs are seldom attacked simultaneously, a fact more particularly marked in typhus and the exanthematous fevers, and seldom only is the catarrh equally intensely developed throughout the bronchi of a lung. Generally, the secretion is most profuse in the lower lobes, and the morbid alterations of the mucous membrane more marked than at the apices of the lungs; this is probably due to purely mechanical circumstances, the greater part of the secretion of the upper lobes descending by its own weight into the principal bronchi, while it can only be removed from the lower lobes by the action of the ciliæ, and by violent expirations and coughing.

The affected portion of the mucous membrane is of a pink-red color, where the inflammation has attained a high grade. Its vessels present an arborescent injected appearance, and this injection increases more and more, and finally in the highest grade becomes so intense that the mucous membrane assumes a scarlet-red, velvety appearance. At the same time it increases in thickness, as may be ascertained with the greatest ease by making a few transverse incisions into it, and by comparing the incisions of a normal bronchus with those of a catarrhal bronchus, both being of the same order. In, addition the mucous membrane appears softened, is easily lacerated, and cannot be pulled off in patches from the submucous tissue.

But the inflammatory redness should be strictly distinguished from the redness of imbibition, which is found in all cadavers after putrefaction has begun. In morbilli, it is claimed that sometimes the bronchial mucous membrane is covered with the same spots as the integument; in small-pox, pustules are met with in the trachea and in the bronchi of the first and second order. The erosions, which accompany chronic bronchial catarrh of the adult, have never yet been found in children, even when they had a cough for many years.

The secretion is sometimes frothy, and whitish, sometimes only permeated by a few air-bubbles, a semifluid, yellowish mass, filling up the whole calibre of a bronchus. Microscopically, it is composed of a few characteristic epithelium-cells, most of which are seen to be oval without complete angles, and of pus-cells which here are unusually large, finely granular, and globular. In addition to these inflammatory corpuscles, now and then entire pieces of softened mucous membrane are found.

When a slight pressure is exercised upon the incised catarrhal lung, a drop of this secretion will ooze out from every diseased bronchus; the number and size of the yellow dots thus produced in the red pulmonary parenchyma furnish a means of judging the extent and severity of the catarrh. I am unable to decide whether coagulæ of fibrin also occur in this secretion, as some authors state, for I have never yet found them. It is remarkable that lungs thus affected do not collapse on opening the thorax, on account of the large quantities of the accumulated secretion, which prevent a communication between the external air and that in the lungs. In chronic catarrhs, the bronchi become somewhat dilated, a condition caused by the supervention of softening and atony of the mucous membrane. But the dilatation is always slight, cylindrical, and never cystic; cystic bronchiectasis never occurs in the infant. In bronchial catarrh one portion or another of the pulmonary parenchyma sooner or later generally becomes affected in the form of lobar pneumonia, which will be specially described in the following section.

Symptoms.—They are divisible into subjective and objective. The subjective only come into consideration in children who are more than two years old, and consist of pains along the sternum, to which, during cough, a girdle-like pain, corresponding in direction to the insertion of the diaphragm, becomes superadded, and sometimes in a general *malaise*, which manifests itself by a depression of spirits, and disgust for the customary amusements. The objective symptoms are derived from physical exploration, from the kind of cough, the expectoration, and the invariable fever. The cough is always the most striking symptom; it alone causes the parents to seek medical assistance. Generally, the paroxysms of cough are tolerably severe, and last from half to one minute, recur several times in the hour, are less frequent during sleep, but do not cease completely. Many children sleep on, notwithstanding the cough; others, however, always wake up, and from these constant interruptions in their night's rest become very much reduced. The short, abrupt, frequently-recurring, hacking cough is very suspicious, for it usually points to the existence of tuberculosis. A bad sign furthermore is, when the children cough more when laid on one or on the other side than on the back, for this cough too, in most cases, is due to great material alterations in the pulmonary structure. Children with simple bronchitis cough less in the dorsal decubitus than in the upright posture; no difference can be noted in them between the dorsal and the lateral decubitus. Nor is the pain so severe as to cause them to distort the face when coughing, or to give other manifestations of pain after the cough has ceased.

The expectoration, so important in adults, enabling us to judge of the condition of the lungs, is very seldom seen in children. By the sound of the cough it is, indeed, perceived whether any mucus is or is not propelled out of the larynx, but, from the hawkings and the rotatory movements of the tongue of children from three to five years of age, we learn that they do not know as yet how to execute any other movement than to regularly swallow down again the sputum that has already reached the root of the tongue. Only when the paroxysms of cough are very violent, and the mouth is held wide open, is it possible, occasionally, to see the sputa; they may be often easily obtained, after a loose cough, by wiping the root of the tongue with a clean piece of rag, to which they will remain adherent. In bronchial catarrh, the sputa are either white and frothy or yellowish, and then, as a rule, less rich in air-bubbles. They are never colored bloody; still, as in every violent exertion, so also from coughing, small bleedings may take place from the larynx, fauces, and mouth, the blood of which, however, is never uniformly mixed with the sputa, but always seen in clear single streaks, or in masses. In the majority of cases, the expression of the face, in simple bronchitis, is but little changed; since, as a rule, no fever is present, the temperature of the head, therefore, also remains unaugmented, and no reddening of the cheeks is observable. But, if the bronchitis is very extensive, if the bronchi of all orders, in both lungs, are affected, then a very marked cyanosis supervenes, for which, when such a child is seen for the first time, a different cause is uselessly sought in the circulation. Such an extensive affection of the bronchi is extremely dangerous, the respiration is as labored as in pneumonia, and death ensues usually by suffocation. In the dissection, the pulmonary parenchyma is only occasionally found perfectly normal; generally, lobular pneumonia has supervened in several places.

The physical exploration of the lungs of small children has already been commented upon on page 18. All the cautions and deviations from the examination of the adult were enumerated there, and will have to be kept constantly in view in the following section on the various pulmonary affections. The examination of older children—those that are over five years of age—differs in no respect from that of the adult, but in children of from one to five years the possibility of such an undertaking depends entirely upon the conduct of the physician. The main point always is, and always will be, to get on friendly terms with the child, and then only to commence the examination. If the child is immediately ordered to be undressed, and the percussion and auscultation undertaken without any further precaution, in ninety-nine cases in one hundred an uproarious cry will be set up, which will not cease till the cause has been altogether withdrawn—still more, it will always be set up again as soon as the physician, who has created such an impression, returns; under which circumstances the formation of a correct diagnosis and the institution of a rational treatment are, of course, altogether out of the question.

Percussion in bronchial catarrh gives totally negative results; the tympanitic percussion-sound generally is very marked, and the physiological dulness on the right side posteriorly, when the abdominal organs are pressed upward, is, in small children, very marked during bronchitis, for the temporary blocking up of the air in the bronchi, by the accumulated masses of mucus within them, is very readily effected.

Palpation is the most useful, and, at the same time, the simplest method of examination. In bronchial catarrh, mucus and sibilant râles are distinctly felt over the whole thorax, strongest, as a rule, over the larynx and trachea, for here the largest mucus-bubbles burst, and single tenacious mucus-lamellæ are kept in a state of vibration by the current of air up and down. If a conclusion were formed as to the extent of the catarrh, from the extent of surface over which these moist râles are felt, we would very often commit a serious error, for, as often as any râles, at all loud, form in the larynx, it will be easy to feel them over the whole thorax, and a few active coughs, which result in expelling the mucus from the larynx, frequently suffice to cause the rhonchi to disappear from the entire chest. Only when no râles are felt over the neck, but, on the contrary, are perceptible over one side, or over a circumscribed space, then they will not disappear after so short a time, but will be noticeable for weeks, and even months. If any great importance can be at all attached to the feeling of the rhonchi, then it is a less favorable sign when they appear over a circumscribed spot than when they are diffused over the en-the chest, inasmuch as, in the first case, the bronchitis has established itself in the bronchi of the third and fourth order, while in the second a single sputum in the trachea, which will be coughed up in the next hour, may possibly be the cause. But if the râles which are diffused over the whole thorax are constantly felt for days, and even weeks, then it is a proof of the existence of the most extensive bronchitis, which is usually already combined with very considerable dyspnœa.

By auscultation we learn, in bronchial catarrh, little more than by palpation. By a little practice, the rhonchi may be felt just as well as heard; it is even possible to distinguish the pitch and intensity, and, in addition to that, we have the advantage of being able to carry out the examination quicker, more accurately, and with less opposition on the part of the child, by palpation. Auscultation is desirable mostly because by it a complication with pneumonia, which is recognized by fine crepitation, and, later, by bronchial respiration, may be diagnosticated. I cannot participate in the views of some authors, who maintain that fine crepitating râles are heard in bronchitis capillaris. By this hypothesis the last distinguishing mark between bronchitis and pneumonia would be lost, and the confusion, which is already sufficiently embarrassing without this, would thus become still greater. Where crepitating râles are heard in a child, simple catarrh of the small bronchi cannot be assumed to exist, but a pneumonic, alveolar disease. The presence of rhonchi of various kinds, and of rough vesicular breathing, answers for bronchial catarrh and bronchitis; crepitating râles and, still less, bronchial breathing, ought never to occur in this condition.

The respiration in children with ordinary bronchitis does not deviate from that of the physiological state, but, when the affection is very extensive, the respirations become more frequent and laborious; but, as fever generally is superadded, and also accelerates the respiration, it is difficult to determine how much of the frequency of the respiration should be ascribed to the catarrh, and how much to the fever. The movements of the alæ nasi, which accompany every act of respiration, are very rare in bronchitis, and, almost without exception, indicate a complication with pneumonia.

The duration of this disease varies exceedingly, according to the cause and the constitution of the child. A child that is not predisposed to catarrhs may contract a cough through external irritation, such as cooling of the thorax, too cold air, injurious and impure atmosphere; but it hardly ever lasts long, and disappears in a few days. On the other hand, there are children who, without being the progeny of tuberculous parents, suffer for years, with only short remissions, from bronchial catarrhs; and, lastly, we have the actually tuberculous, who very seldom get rid of it. The prognosis is not always to be given as favorably as we should be inclined to assume from the general well-being of the child. The simplest bronchitis, when it becomes greatly diffused, may eventuate in death by suffocation; that founded upon tuberculosis, of course, offers but a very unfavorable prognosis.

Etiology.—There is hardly a child living who has not had a bronchial catarrh in early life, and there is no age at which this affection occurs oftener than in that of the first childhood, particularly at the time of the first dentition. Thus, for instance, all children cough who drivel during dentition, for the garments are perpetually kept wet by the saliva, and that produces a cooling of the chest. Bronchial catarrh prevails more generally in winter than in summer, in the cities and quarters inhabited by the poor, more frequently than in the country. Children reared in dusty manufacturing cities usually suffer, and children of tuberculous parents so regularly suffer from it that it does not at all attract attention, and therefore is not mentioned, if special inquiry be not made concerning it. Besides these more external causes, there is also a contagion which conveys the bronchial catarrh from one person to another, namely, influenza (die Grippe). Essentially it consists of a bronchial catarrh, which is ushered in by febrile symptoms and anorexia, and spares no age, not even the youngest infant. In healthy children, influenza has its regular course, and, in from two to three weeks, terminates in complete recovery; in tuberculous children, on the contrary, it often ushers in the further development of the cachexia, the children continue to cough, become feverish, and finally perish in a hectic condition.

Bronchitis, furthermore, occurs as a complication in a number of general diseases. Thus the bronchial membrane, like the intestinal mucous membrane, is implicated in every typhus fever, and, in mild cases of febris typhodes, this constant symptom is the most important one in confirming the diagnosis.

Rokitansky is even of the opinion that bronchitis (bronchostasis) forms the foundation of the exanthematous contagious typhodes, such, for example, as occur in Ireland.

The more detailed views concerning this condition have already been given on page 185, in connection with typhus abdominalis.

Bronchitis, lastly, is a constant symptom in measles, where it probably originates through a morbillous efflorescence of the mucous membrane, and hence must occur without any exception. It is frequently met with in scarlatina, and in both genuine and spurious variola.

Treatment.—There is no remedy that has a marked direct influence upon the course of bronchitis. All the methods of treatment hitherto recommended are frequently found to fail. There are principally two symptoms, for the subjugation of which every effort should be made, namely, the dyspnœa, and the immoderate secretion. The first originates through the accumulation of the bronchial mucus, with the removal of which it also disappears, and the best means for effecting this is the act of vomiting. It is not necessary to give strong emetics, for, by these, vomiting is produced too rapidly, and the retchings, which in reality are the most important results, by no means stand in direct relation to the size of the dose. A very good means of inducing protracted retching and vomiting consists in the administration of a strong infusion of ipecacuanha (ʒ j to water ℥ j), of which even one teaspoonful has the strongest effect without implicating the alimentary canal. If, during and after vomiting, no large quantities of mucus are expelled, and if the breathing does not thereby become easier, any further emesis will prove useless, and will only give rise to a chronic gastric catarrh, by which the child is very much reduced. As to the class of expectorants, the vegetable ones only are recommendable, and even these should only be used in cases where no disturbance of the digestion exists. When the latter supervenes, the harm caused by the expectorants is more apparent than their very problematical usefulness, and this remark is especially applicable to the antimonials, *tartar emetic*, *sulphuret of antimony*, *kermes-mineral*, and *white oxide of antimony*. Muriate of ammonia, so much in vogue in bronchitis of the adult, usually is not administrable to children in any form. In acute catarrh of the bronchi of infants, a mild infusion of ipecacuanha (gr. j to water ℥ j), with a little *oxymel simplex*, or a very dilute solution of *kali carb.* (gr. ij— ℥ j) are the most appropriate remedies. *Little* very highly recommends frictions of the chest with turpentine every two or three hours, and covering of the chest with flannel. When the paroxysms become spastic, antispasmodics and narcotics are indicated, which not only exercise a favorable abortive effect upon the severity of the cough, but also upon the course of the disease generally. Chief among these is *aq. amygdal. amar.*, given in two or three times as many drops pro dosi as the child numbers years of age, three or four such doses daily; next laudanum, in doses already mentioned, several times; ext. belladonna, gr. $\frac{1}{20}$ to $\frac{1}{10}$, several times daily, etc.

When tuberculosis is at the bottom of the catarrh, this treatment of symptoms, as a rule, proves entirely fruitless. In these cases *ol. jecor. iron* and *quinine* must be tried. Pulv. cinchona, given in quantities such as can be taken up on the point of a knife, can be administered to almost all children, and I have frequently seen very suspicious bronchitis, accompanied by febrile exacerbations and emaciation, disappear under a continuous employment of this remedy for from four to eight weeks. The temperature of the room in which the little patient is confined should be uniformly warm, the garments warmer than those worn in health; the drinks should be plentiful, so that a beneficial perspiration may be established. If the cause of the catarrh still continues, its removal, of course, must be attended to; it should be particularly insisted upon not to allow the children to remain in dusty manufacturing cities, as is so often the case with the laboring classes.

In order to guard against further bronchial catarrhs, and to counteract the disposition to that disease, a systematic inuring is to be urgently recommended. As regards the clothing, no definite directions can be given; at any rate the garments should not be so warm as to make the children feel uncomfortable, and cause them to perspire profusely on taking a little exercise. More catarrhs are undoubtedly produced by these warm dressings than prevented. The best and most rational means of inuring is to sponge the whole body with cold water before the child retires for the night; this may be commenced with immediately after the eruption of the canine teeth.

(2.) LOBULAR AND LOBAR INFLAMMATION OF THE LUNGS (*Pneumonia Lobularis et Lobaris*).—Pneumonia occurs extremely frequently in children, generally, however, in a form which anatomopathologically presents a different picture from that which we are in the habit of finding in the autopsies of adults. Namely, the lungs do not become extensively inflamed, throughout one or more lobes, but only in some places scarcely of the size of peas, between which normal pulmonary tissue is found in tolerable quantities, a process that has been correctly described as lobular pneumonia. Lobar pneumonia, it is true, also occurs, but comparatively much less frequently; it may come on idiopathically, or be produced by a blow, as in the adult; usually, however, it is like pleuritis of the new-born child, of a pyæmic nature. In the latter case it always terminates fatally; the prognosis, on the whole, even in lobar pneumonia, not of a pyæmic character, is also extremely unfavorable. In the nursling, lobular pneumonia is an extremely frequent affection, and carries off many children, especially during the period of dentition. In foundling-hospitals many children die from it, and the horizontal posture in which these children are kept both night and day has been considered the chief cause. What tends to confirm this view is the circumstance that, in most of the autopsies, the posterior and lowest portions of the lungs, and consequently the most depending parts, have been found oftenest affected. Moreover, it has been statistically demonstrated that many more children suffer from it in winter than in summer, and that a part of the lung is never found with lobular inflammation to which the bronchi leading to it do not also exhibit a considerable degree of catarrh. The relation of lobular pneumonia to bronchial catarrh is probably of such a character that the gravitating secretion acts as an irritant, and perhaps mechanically upon the region in which the affected bronchi terminate, and that at the irritated places small pneumoniæ develop themselves secondarily. We have here, therefore, the relation of cause to effect. This condition also arises in most cases of croup, and lobar pneumonia is about as frequent here as lobular pneumonia, and the extension of the false membranes—whether they are thick or thin, confined to small or large surfaces, or extend far down into the bronchial tube on all sides—has no particular influence upon the origin of pneumonia. It is also found in almost all the cadavers of children who have succumbed to sclerema, and often it supervenes as the closing scene in tuberculous lungs.

Pathological Anatomy.—The anatomo-pathological processes are, as the names already designate, of two kinds, and lobular pneumonia is distinguished from lobar, not only as regards the extent but also as regards the quality of the exudation.

Lobar pneumonia, with the exception of the metastato-pyæmic form, occurring in lying-in and foundling-hospitals, is remarkably rare in the nursling, but wherever it does occur it displays the same morbid alterations as in the adult. Here also we have a *red* and *gray* hepatization, according to the time of the occurrence of death. The exudation is not poured out between the pulmonary alveoli nor into their walls, but into the cavities themselves, filling them up completely, and having the properties of purely croupous exudation. The red hepatized lung does not collapse on opening the thorax, it is totally emptied of air, the cut surfaces are dry and brownish red, mostly uniformly granular, and such portions of the lungs are as friable as the parenchyma of the liver. The granular quality of the section is produced by the elastic fibres lying between the alveoli, which are swollen by the deposit of firm exudation. The red color of the exudation is due to the interspersion of blood-corpuscles.

The exudation, which, with the exception of the blood-corpuscles, primarily was amorphous, becomes quickly transformed into albuminous and muculent masses; cells soon begin to form, which are produced alike from the alveolar walls and from the exudation. The blood-corpuscles meanwhile are undergoing dissolution, their coloring matter disappears, the entire mass changes its color, grows pale—gray hepatization—and the exudation constantly grows more like pus, on account of which the French physicians have also called it *infiltration purulente.* Finally, the contents of the alveoli dissolve to a milk-like consistency, and are immediately absorbed, and then the rather rare process of a complete *restitutio in integrum* occurs. Occasionally large abscesses form, and still more rarely complete obsolescence, hardening, and induration, of the pulmonary tissue take place. In children lobar pneumonia never degenerates into tuberculous, as sometimes occurs in the adult, for tuberculous children generally succumb in the first few days after having acquired the croupous pneumonia.

Lobular pneumonia is not a croupous, but a catarrhal inflammation. Here small spots in the healthy pulmonary parenchyma become diseased, which, although they sometimes aggregate, nevertheless do not present the morbid appearance of the croupous lobar pneumonia. Generally, the disease involves both lungs, the right more than the left, and the posterior parts of the lower lobes are oftenest affected. Such lungs do not collapse completely, and this is not due so much to the lobular pneumonia as to the bronchial catarrh that constantly accompanies it, and when they are felt in different directions a few hard nodules will be found near their surface or deeply within them. If these nodules are now divided, bluish-red, denser spots, without sharp circumscriptions, will be seen in the transverse section. The walls of the pulmonary air-cells are intensely swollen, and, when they are scraped with the scalpel, a reddish, muculent, but sparsely-frothy secretion is obtained. The lobules affected with pneumonia seem to be somewhat beneath the level of the surface, on account of the pulmonary tissue surrounding them being mostly emphysematous, and their darker color makes them easily recognizable. If such places are carefully cut out, so that no normal pulmonary substance remains attached to them, they will sink completely in water, and do not present the least trace of crepitation. But, by inflating the whole lung, they again become filled with air to a certain extent, in contradistinction to the croupous pneumonia, in which inflation has no effect whatever; still these inflated lobules always retain a darker-red color, and a perceptible hardness. The microscopical examination shows that the pulmonary vesicles are filled with large quantities of newly-formed epithelium-cells and fluid exudation. We have here, therefore, no red and no gray, in fact, no *hepatization* whatever, for which a firm, solid exudation is always necessary, and hence also no different stages. Even when lobular pneumoniæ become confluent, the lobules are nevertheless distinguishable from croupous lobar pneumonia, by the absence of friability, by the possibility of forcing air into them by inflation, by the greater moistness, and by the remaining free parts which at all times are interspersed between those affected. The process always remains catarrhal, never becomes of a croupous nature. When pneumonia is superficially located, we find in addition exudations upon the pleura, and invariably bronchitis in the bronchi leading to the inflamed places. The secretion in the arachnoid sac of the medulla spinalis is said to be augmented. The most common complications are thrush, enteritis folliculosa, and sclerema.

Symptoms.—The symptoms of lobular and lobar pneumonia may be very properly described together, since all the signs, with the exception of one, furnished by percussion, differ but little from each other. In the following description, children under two years are referred to: children who have passed the first dentition seldom suffer from lobular pneumonia. They usually have lobar pneumonia, which differs in no respect from that of the adult. The physical diagnosis of infantile pneumonia is attended by great difficulties, and requires much patience and time. The children are invariably opposed to the examination, and set up such a cry as to render all investigation impossible. Added to that, the sputa are also entirely absent, and by their very absence demonstrate their importance in the confirmation of the diagnosis. For this deficiency, however, we are indemnified by the characteristic appearance of the child, and a very peculiar kind of respiration, whose presence is so characteristic that with a little practice it is possible to diagnosticate such an infantile pneumonia even before the child is undressed.

It is seldom possible to accurately establish the commencement of a lobular pneumonia, for a bronchial catarrh always precedes it for some time, and its transition into pneumonia does not take place at once. It is generally ushered in by a cough, without fever, which grows worse and worse; sooner or later fever supervenes, the temperature of the skin constantly rising higher, and in a few days the whole train of symptoms of pneumonia is fully developed.

The most striking symptom is great acceleration of the breathing, which may rise to sixty and eighty per minute, and have an inverse rhythm. While in health the accent lies upon the inspiration—if the respiratory sounds be at all audible—in pneumonia, the accent falls upon the expiration, which is accompanied by a louder noise than the inspiration. The most energetic contractions of the diaphragm are now seen. At every respiratory act the intercostal spaces sink, producing a momentary depression beneath the nipples, extending toward the sternum. In a higher grade of pneumonia, the facial muscles also participate, the alæ nasi rise—a phenomenon upon which too much attention cannot be bestowed—the mouth is opened, the angles of the mouth are drawn downward and outward, indicative of suffering, and the eyes glassy, staring, or anxiously rolling about.

These symptoms of the respiratory modus, and the facial muscles, are not more pregnant with information than are the results derived from the physical examination fruitless.

Percussion gives a purely negative result in lobular pneumonia; in the lobar form, marked dulness is found over the inflamed places—a dulness which, in contradistinction to the physiological dulness during abdominal pressure, may be demonstrable without percussion, both during the inspiration and the expiration. That this physiological dulness posteriorly on the right is very frequently confounded with the pneumonic dulness is but too evident, from the fact that it is expressly stated in all the text-books that croupous pneumonia establishes itself by preference in the right lower lobes.

Also the rapid and generally favorable course that is ascribed to and claimed for pneumonia in the yearly reports of children's hospitals and nurseries, shows tolerably plainly that the error is of frequent occurrence.

The rest of the precautions that are to be observed in percussion have already been stated in the general part, page 20.

By *auscultation*, fine crepitating râles may be detected in lobular pneumonia; but by this we do not intend to say that no pneumonia exists wherever these are absent, for the dense places which give rise to them do not always lie near the periphery. Added to that, bronchial catarrh is always present, the sonorous râles of which often mask the much less audible crepitations, and the latter are also inaudible when the affected places are very much scattered between large portions of healthy parenchyma. As they are usually perceived within a small circumference only, a very close examination of the entire dorsal surface is, therefore, necessary for this purpose, which, in restless children, or in those that have once been disquieted, is impossible, even with the utmost patience and perseverance. Sibilant râles are invariably heard over both lungs. Crepitating râles is a valuable sign in confirming the diagnosis; their absence, however, does not exclude pneumonia.

In lobar pneumonia, fine crepitation, as in the adult, is heard at first; then, for several days, distinct bronchial breathing, strong consonance of the cough, of the voice and rhonchi, and, thereupon, crepitation again; till finally, at the end of eight or nine days, in case of recovery, normal vesicular respiration returns, if the still-existing bronchial catarrh does not produce for some time diffused sonorous râles.

By *palpation* nothing but sonorous râles are felt in lobular pneumonia; the vibrations of the thorax, caused by coughing and crying, are alike on both sides. In lobar pneumonià, stronger vibrations of the cough, of the rhonchi, and of the voice, are felt over the parts corresponding to the dulness, or they are not to be felt at all if the bronchi leading to the solidified lung are momentarily occluded by mucus. Palpation of the thorax cannot be too zealously practised, for in the crying child it is the only means which can be employed with benefit.

The cry of children suffering from pneumonia is characteristic: it is never very loud, and still less continuous; it should rather be called abruptly-interrupted moans and groans. The cough is frequent and persistent in all cases; when it becomes violent and paroxysmal, little white foam appears between the lips, even in the youngest children; generally, however, no expectoration whatever is to be seen. The cough is distinguished from that in bronchial catarrh by being apparently productive of pain, the children groaning pitifully after each paroxysm, and, at the same time, distorting the countenance in evidence of suffering.

The general symptoms vary according to the extent of the disease and its complications. The fever of lobular pneumonia usually begins after protracted feverless vespertine bronchial catarrh, disappears in a few hours, only to return with greater frequency and violence, till finally it becomes continuous. The skin is felt to be hot and dry, but the feet are cold and difficult to be warmed. The pulse becomes uncommonly rapid, and may rise to two hundred beats per minute. That is the utmost limit which, by any practice, it is possible to count.

In most cases of lobar pneumonia, the fever begins suddenly, even before the symptoms of disturbed respiration become apparent, and is as severe as in the eruption of an acute exanthema. On the following day the pneumonia comes on, and assumes its cyclical course. The consecutive cerebral symptoms do not depend upon the extent of the pulmonary affection, but upon the individual irritability. There are children who, in the most violent lobar pneumoniæ, retain a free sensorium, and others, again, who in the slightest ailment are attacked by all sorts of convulsions and nervous phenomena.

There is complete loss of appetite, the thirst is great, and the secretion of urine corresponds to the amount of liquids drank. The stool is frequently diarrhœal, because the majority of those affected with pneumonia suffer from the effects of dentition, and these, as a rule, are attended by loose stools. As this is often a result of the treatment, the impropriety of such treatment will be discussed more in detail in the future.

The *course* is extremely rapid in lobar pneumonia, for death or improvement ensues in from six to eight days. In young children the fatal termination is more frequent than recovery. Children over two years of age bear lobar pneumonia as well as adults. It is difficult to determine the commencement of a lobular pneumonia, on account of its gradual development from a simple bronchitis, which must have preceded for at least four or five days, but may have existed for weeks and even months. Its course is by no means cyclical, sometimes rapid, and attended by such pronounced symptoms, that every lay person is able to recognize an alteration in the lungs, sometimes so gradual and insidious that it escapes the most experienced diagnostician. Such children seldom recover completely in less than two or three weeks, but, when it tends to a fatal termination, all the symptoms become aggravated, the dyspnœa and the frequency of the pulse increase, the extremities become cool, the nails cyanotic, the facial muscles distorted more and more, and now the expirations are not particularly accentuated. Finally, the respirations grow more infrequent, become gurgling or gasping, and death takes place by convulsions. In lobular pneumonia, which seldom occurs before the second or third week, *Bouchut* lost thirty-three out of fifty-five patients, ranging from a few days to two years of age. According to *Valleix*, all the new-born children in the Parisian foundling-hospital attacked by this disease die (out of one hundred and twenty-eight children one hundred and twenty-seven died). *Trousseau* has described, as a most unfavorable prognostic sign, the swelling of the veins of the back of the hand. This sign is significant, in view of the fact that the cutaneous veins can only be seen in emaciated children, and that these children rarely recover from pneumonia. In robust children who perished by this disease, I never observed any swelling of the veins of the hands during its entire course.

Treatment.—Since every pneumonia is preceded by a bronchial catarrh, it is evident that in young children it ought never, under any circumstances, to be slighted. Those measures recommended in the previous section are immediately to be resorted to. The patients should be kept in a uniform temperature; should not, even in summer, unless the air is perfectly still, be carried out of the room; and should be kept warm and dry, especially about the chest. Internally, small doses of opium, belladonna, or *aq. laurocerasi*, are very appropriately given. This treatment, with strict surveillance, must be continued until the last traces of cough have disappeared. Whoever has treated many children with lobular pneumonia, and has seen the much-praised remedies disappoint expectations, will not regard this minute and careful prophylactic treatment of a simple bronchial catarrh as pedantic and over-anxious. It is necessary to become habituated to regard the bronchial catarrh of every teething child as the possible beginning of a pneumonia. Too often, unhappily, experience will prove that this view is a perfectly justifiable one.

Abstraction of blood is still pretty generally recommended in both lobar and lobular pneumonia, when already fully developed, and leeches are resorted to for that purpose with especial preference, for cupping is too painful, and, on the small surfaces of the thorax, their application is rendered difficult. Phlebotomy is usually impracticable, on account of the smallness of the cutaneous veins and the density of the subcutaneous fascia. Two or three leeches are therefore applied around the nipple, upon the sternum, or, according to *Bouchut*, on the inner surface of the thigh; the subsequent hæmorrhage to be encouraged for an hour. For the last five years I have not employed them at all, and must confess that, since then, I am more satisfied with the results of my treatment. I have frequently had opportunities, in consultation, of observing children in whom leeches had been employed by physicians differing from my views in regard to the abstraction of blood, and can report nothing favorable whatever of the course of pneumonia treated in that manner. Most of the children were prostrated and anæmic, the lips were blanched and eyelids pale, and, although temporary mitigation of their dyspnœa was said to have resulted, no such improvement was to be seen on the second day after. This treatment can be regarded as abortive in no other sense than that these children die sooner than those treated on the expectant principle. When this treatment is followed by recovery, convalescence lasts very decidedly longer, they retain their pale color and anæmic appearance for a long time, and their development is much retarded. Therefore, since I have never yet seen any marked benefit, but, on the contrary, very lamentable effects, produced by leeches, it would be totally inexcusable on my part not openly and directly to protest against the practice of abstracting blood.

And I may say the same of the much-lauded tartar emetic, which men, in other respects of sound judgment (*Valleix*, for instance), extol. Intestinal catarrh, according to the most extensive experience and observation, is the most frequent complication of pneumonia, and all those remedies are therefore to be avoided which are liable to produce it. The chief of these is *tartar. stibiat.*, which, particularly in small doses, insufficient to induce vomiting, almost invariably produces a diarrhœa that is difficult to arrest. The injurious effect of this agent upon the intestinal canal is earlier and more surely manifest than its favorable antiphlogistic and expectant action. In this respect, even ipecacuanha, although much less frequently, may do harm, yet the diarrhœas following it are of much shorter duration, less pernicious, and easily controlled by small doses of opium. In dyspnœa and suffocative attacks, a few teaspoonfuls of a strong infusion of ipecacuanha (ʒ j to water ℥ j) act decidedly favorably, but even this should not be given more than once in twenty-four hours, at the utmost. Diarrhœa must be arrested immediately by small doses of laudanum, one drop *pro dosis*, for example. A weak infus. ipecac. (gr. j—ij to water ℥ j) causes neither vomiting nor diarrhœa, and therefore, in this respect, is harmless; but whether the expectoration of the catarrhal secretion is thereby materially facilitated is another question. It may be safely stated that the changes in the kind and severity of the cough following its administration are not very striking.

When the skin is burning hot, and no diarrhœa is present, I give one-eighth of a grain of calomel, four or five times daily, until green, semi-fluid stools ensue; after that a simple mucilage of gum-arabic, with a little syrup simpl. and tr. opii gtt. j—ij, until constipation is produced. The infus. ipecac. is avoided as long as possible, but may be prepared and preserved in a cool place till required. In cases where the dyspnœa increases rapidly, a large quantity of bronchial mucus is often suddenly expelled by an energetic act of vomiting, and in this manner very apparent palliation is frequently obtained. In all cases, the local treatment consists in the application of a moist girdle, in the following manner: A diaper, or a large white pocket-handkerchief, is folded up like a cravat; the bandage thus obtained should be three or four fingers wide, and the whole length of the handkerchief. This is now dipped in tepid water, and wrung out so that the cloth does not drip, and then applied, like a girdle, around the chest of the child. A second cloth, double the size of the first, is folded up in the same manner like it, but which must be six to eight fingers broad, and then applied, dry and warm, over the first. It is very advisable to interpose a piece of gutta percha between the dry and the wet girdle, by which, on the one hand, the moistness of the first cloth is preserved longer, while, on the other, the second does not become wet. If the water with which the fomentations are made is not too cold, the child will tolerate them very well, and, in a short time, a slight retardation in frequency and improvement of the respiration are indicated by less motion of the al ænasi. These tepid compresses should be continued for from four to six days, and it is not at all necessary, during the entire time, to remove the bandage; the gutta percha is raised up a little, and a few teaspoonfuls of water are poured upon the girdle, or it is moistened with a sponge. The principal thing is not to allow a cooling of the skin by evaporation to take place. To secure this object, the dry cloth should properly overlap the moist one on all sides, and, as it is impossible to prevent the upper cloth from becoming wet, it should be changed several times during the day. I certainly have applied this girdle many hundreds of times, and have very often seen rapid improvement ensue; nevertheless, it cannot be denied that the half of these children perish notwithstanding. If *cold* compresses are applied to the children, as recommended by some authors, a cry of fright is the consequence; the child is seized with a feeling of dread, the breathing is palpably accelerated, and does not subside until the cold water has become warm through the temperature of the skin. Hence it seems more rational to make the compresses warm at once, by using warm water, in order to avoid the temporary restlessness and discomfort to the child.

(3.) ACQUIRED ATELECTASIS OF THE LUNGS.—Congenital atelectasis has already been treated of (on page 54) in connection with the diseases which are regarded as the immediate effects of the delivery; it therefore only remains for us to speak of the acquired atelectasis. This affection has the most intimate connection with rachitis of the thorax, and therefore mostly occurs in children between the ages of six months and three years. In many cases the augmentation in the density of the pulmonary tissue and the final atelectasis are due to a marked curvature of the spine, to a distended pericardium, hypertrophied heart, to aneurisms or neoplasms. It is found most exquisitely marked in pleuritic exudations, where the lung is compressed to the thickness of a finger and correspondingly condensed.

Pathological Anatomy.—The degrees of atelectasis vary exceedingly. A mere increase in the density may occur, which is recognized by the augmented consistency, but the compression may also attain to such a high degree as to cause a total obliteration of the alveoli, and the disappearance of the capillary vessels. At first these compressed and atelectic places contain blood and have a great similarity to muscle, on account of which this condition has been called carnification; but, when it has existed for some time, they become bluish brown or gray, shrink up into a leathery rind, the pulmonary tissue cannot be recognized, and is converted into a fibro-cellular mass, which is gradually displaced by the slightly emphysematous surrounding parts, and ultimately disappears altogether. Such solitary atelectic places are very rarely found, at least, in older children and adults. Sometimes it is still possible to inflate such atelectic places, if they are of but recent formation; generally, however, this experiment proves fruitless, for the alveoli have actually disappeared, and been replaced by a fibro-cellular mass.

When the lesion is extensive, it will have a similar effect upon the circulation as pulmonary emphysema. The capillary circulation becomes so impeded here, that a stasis takes place in the trunk of the pulmonary artery, producing dilatation of the right side of the heart, and finally venous stagnation and cyanosis.

The cause of acquired atelectasis is therefore chiefly to be sought in the rachitic thorax; the latter, however, originates in the following manner: The inspiration is brought about by the contraction of the inspiratory muscles, and a dilatation of the pulmonary vesicles is thereby produced. A momentary rarefaction of the air within them results, which helps to overcome the atmospheric pressure which is becoming stronger and stronger upon the thorax, aided by the elastic pulmonary tissue, which drags inwardly at every inspiration. The combined effects of these forces is an inward curving of the intercostal spaces, and, in lean persons, of the clavicular region also. I was once able to see this condition most strikingly displayed in a child in whom a rib was broken in two places by the shaft of a wagon running against it. The fragment of the rib, one and a half inches in length, was kept in place by mere skin, and flapped in and out with every inspiration and expiration, like the valve of a bellows. If the bony ribs have lost their firmness by being deprived of some of the calcareous salts, they will also participate in the inward movement, which otherwise is only seen in the intercostal muscles, and thereby lose their external convex shape. Moreover, they also yield to the diaphragm, which, by the pressure of the abdominal viscera, drags upon them so as to retard their longitudinal growth (producing rachitic shortening of the bones). By these various forces is finally produced a distorted, contracted, and misshapen thorax, the contents of which necessarily must suffer, more especially as, in consequence of the curving and retarded growth of the spinal column, it is also lessened in perpendicular dimension.

Symptoms.—In consequence of the diminished number of pulmonary cells containing air, an acceleration of the respiration necessarily must result, if an interchange of gases corresponding to the bodily weight is to take place. The respirations, in fact, are quickened and executed with considerable exertion, the alæ nasi thereby participating. The application of the stethoscope to the rachitic thorax is attended by many difficulties, for the button-like sternal ends of the ribs, and the concavities in the region of the nipples, render a perfect adaptation of the instrument impossible. We almost always have to confine ourselves to an immediate auscultation of the back, and generally hear sonorous râles in all parts, because the bronchi leading to the atelectic portions are affected with catarrhal inflammation. Over the diseased places proper crepitating râles and bronchial breathing are heard, provided the sonorous râles do not drown all other sounds. But on the infantile thorax, and especially the rachitic, the vesicular, puerile breathing is so sharp, and the expiration so loud, that the distinction between puerile and bronchial breathing consists only in a fine modification of the sounds, and the utmost skill is requisite to distinguish with certainty between the two.

By percussion it is but rarely possible to demonstrate the atelectic places, for, in most cases, they are too small in extent, and very frequently border on the liver, where, by the incarceration of the borders of the lungs between the upper surface of the liver and the inwardly-curved ribs, a condensation of the tissue is produced. Besides, we must always take into consideration the physiological dulness during the abdominal pressure, the rachitic condensation of the scapular portion, and the similar condition from the curvature of the spinal column that very frequently occurs, before we can ascribe a discovered dulness to atelectasis.

From what has been said hitherto, no difference will have been discovered between the symptoms of pneumonia and those of acquired atelectasis, and in reality there is but one symptom by which we are enabled at the very first sight to discriminate between these two conditions. In pneumonia a burning hot skin is always present; in atelectasis, on the contrary, it is absent. But when, in a rachitic child, with acquired atelectasis casually, or from dentition, or some other acute affection, fever becomes superadded, then no one is able to decide from one examination as to the correct diagnosis. Only the course of the accidental complication, the continuance of the dyspnœa and the respiratory modus after the fever has disappeared, can clear up the obscurity and aid us in the diagnosis. This diagnostic difficulty is an additional reason why pneumonia should not be treated instantly by leeches and antiphlogistics. In all cases such a treatment agrees very badly with rachitic children.

The progress of rachitic acquired atelectasis is always very gradual; the course is chronic, and may be prolonged for years. With increasing invigoration, and recommencing growth of the ribs, the respirations become slower, the strong inward curving of the fourth to the eighth ribs decreases with every inspiration, the pigeon-breast subsides, the auxiliary respiratory muscles of the neck and alæ nasi cease to participate actively.

But if no such consolidation of the thorax takes place after several months, and if the atelectasis progresses and implicates still larger portions of pulmonary tissue, then the portions that still remained normal will be unable to perform the extra amount of labor thus imposed upon them. A still more intense bronchitis is now liable to supervene, and the subjects die from paroxysms of suffocative cough, after having suffered for weeks, and even months, from the most violent dyspnœa. Œdema of the feet precedes death in these cases sometimes several weeks.

The prognosis depends upon the degree and the duration of the conditions. The more developed the pigeon-breast, the more extensive the solidification of the tissue, the greater the dyspnœa, the more imminent is the danger of the child's being carried off by a slight bronchial catarrh, or by hydræmia, in consequence of defective metamorphosis of the materials. And yet, even very decided disfigurements of the thorax, and the atelectasis resulting therefrom, are often completely recovered from.

Treatment.—The first question always is that of the nutrition, the second that of the residence. As the pigeon-breast only develops itself from the sixth to the ninth month, the children are usually already weaned and fed upon various kinds of broths and soups. However, it is not possible to maintain that any of these methods of nutrition are absolutely injurious, for upon all of them great numbers of children thrive as well as die; and it cannot even be decided which of these ward off the rachitis best, for it occurs in all kinds of diet and all manner of nutrition. The most important point in this relation is, that the food should be well borne and assimilated, and that no diarrhœa or other kinds of digestive disturbance be produced by it. Children with perfectly regular digestion very rarely become rachitic.

Living in damp houses materially promotes the production of rachitis, on account of which it is also much more frequent in winter than in summer, and among the poorer class of people than among the rich. Consequently, the treatment must be chiefly directed to the procurement of well-ventilated, dry rooms, and as long a residence in the country as possible. Where these conditions are unattainable, the termination will generally be unfavorable. Our efforts to eradicate the bronchitis, which invariably accompanies atelectasis, by the use of expectorants, narcotics, or any other class of remedies, will almost always be fruitless. This complication subsides spontaneously, as soon as the lungs have again acquired a more capacious and better condition. I confine my treatment to inunctions of fat upon the breast, several times daily, and internally give *ol. jecor.*, or the malate of iron, more precise indications for which will be given further on, in the treatment of rachitis.

(4.) PULMONARY EMPHYSEMA (*τὸ ἐμφύσημα*, to inflate).—The well-known blubber-like emphysema of the lungs, from which adult patients acquire a barrel-like thorax, and suffer from displacement of the heart and diaphragm, is scarcely ever seen in children; indeed, this kind of rarefaction of the pulmonary tissue seems to be altogether absent in the infantile organism. On the other hand, a vesicular and interstitial emphysema is often found under the following pathological conditions:

Pathological Anatomy.—Purely vesicular emphysema consists in a permanent dilatation of a large section of pulmonary alveoli, which, however, are not ruptured, but only distended to perhaps twice their normal size. This species of alteration of the pulmonary tissue is almost invariable in the vicinity of condensed portions; thus along with pneumonia, atelectasis, and tuberculosis, it is often found. Emphysematous lungs do not collapse on opening the thorax, have a peculiar feel, like a cushion filled with air, are grayish or yellowish gray, anæmic, and, when incised, collapse with a hissing, slightly-crepitating sound. When the condition is of long-standing and in progressive atrophy of the alveolar walls, *interlobular emphysema* invariably becomes superadded.

This condition consists in an accumulation of air in the cellular tissue connecting the different pulmonary lobules with each other, and can only be produced by the rupture of some of the pulmonary cells, and by the escape of air into the adjacent interlobular interstices. Larger or smaller transparent air-bubbles then appear on the surface of the lung, beneath the pleura, which may be displaced in the direction of the interstices, and also ramify into the deeper structures of the lung. Sometimes they circumscribe a pulmonary lobule, in the shape of an island, and, when the interlobular emphysema has developed itself between many neighboring lobules, form large air-bubbles, which may be pushed hither and thither over extensive portions of the pleural surface of the lung. The escape of air into the connective tissue surrounding the bronchi, into the mediastinum anticum, and thence out upon the neck and breast, is a very rare occurrence. These instances almost invariably terminate fatally.

In regard to the origin of the ordinary emphysema, many, and in part untenable, views still exist. It is certain that solidification of one portion of the pulmonary parenchyma will produce a vicarious vesicular emphysema of the rest of the tissue, and that, in the autopsies of atrophic children, principally as the effects of enteritis folliculosa and cholera infantum, interlobular emphysema is usually found. I have formed no positive conclusions upon the occurrence of emphysema from pertussis, as stated in so many text-books; on the whole, I am unable to recall a single instance of ever having met with it in the autopsy of a child who died from pertussis or any of its complications. *Rilliet* and *Barthez* also are opposed to the recognition of this complication; and it follows from this that, aside from the mechanical distention of the alveoli, which, in forced expiration, too, may be produced at the expense of the amount of blood in the lungs, still another special disturbance of the nutrition of the alveolar walls must be present, without which, notwithstanding all exciting causes, no emphysema could be brought about. The inflation of air, in asphyxiated new-born children, has been suggested as an additional cause, but which is not very probable, in view of the fact that the lungs of the new-born child may be inflated, after death, with all the strength possible, without rupturing their air-vesicles. The lungs are so distensible, and, by forced inflation, may be enlarged to such a degree, that one lung will fill up the entire thoracic cavity, and yet, as soon as the air is allowed to escape, it collapses again, without leaving the least trace of emphysema behind.

Symptoms.—In children, the barrel-like shape of the thorax never develops itself, because, as it appears, they scarcely ever suffer from chronic, but always from acute emphysema, and, for that reason also, that depressed state of the diaphragm is not produced. Hence, we have no physical signs for it, and it is a very great question whether the acceleration of the respiration, mentioned in the text-books, had not better be imputed to the pulmonary affections producing the emphysema than to the emphysema *per se*. This condition, therefore, is only of anatomo-pathological importance. The prognosis and the therapeutics, in a disease in which the diagnosis is so uncertain, are, of course, altogether out of the question.

(5.) **Œdema Pulmonum** (*οιδημα*, a swelling).—In most of the diseases of the heart, of the large vessels, and of the lungs, a rapidly-fatal pulmonary œdema supervenes as the final pathological state. Then, of course, it has but little importance as a pathological condition, and is only to be regarded as the beginning of death. On the other hand, in measles, and more frequently in scarlatina, a rapidly-developed pulmonary œdema is met with. It does not, however, always lead to death, but disappears spontaneously or by proper remedies. It is to this latter form in particular that our attention is to be directed here.

Pathological Anatomy.—By pulmonary œdema we understand a transudation of serum into the pulmonary alveoli, the finest bronchi, and into the interstitial tissue. Neither the first nor the last alone can become infiltrated with serum without the participation of the others; and the disputes of some authors, whether the œdema has its site in the alveoli, or in the interstices, may therefore be decided in favor of both. Œdematous lungs do not collapse on opening the thorax, are of a grayish-blue or yellowish-gray color, according to the quantity of blood in the affected parts, are heavier than the healthy lung, swim in water, and crepitate strongly on pressure. The pressure of the finger leaves a pit behind, for the corresponding pleura is also œdematous. On section, the œdematous lung presents a smooth glistening surface, from which a large quantity of reddish or yellowish fine-frothy serum escapes on the least pressure. The escape of this froth is also accompanied by a hissing or crepitating noise. Œdema of the lungs is never confined to small portions of the pulmonary tissues, but generally affects the lower lobes of both lungs, a proof that its cause is not a local, but a general one, and that it must be due to a disturbance of the circulation. Œdematous lungs may be inflated, and thus it is seen that not all the alveoli are filled with serum. The corresponding bronchi contain mucus, and in the bronchi of the higher order a similar frothy serum, like that which oozes out from the cut surfaces, is always found.

Symptoms.—The predominating symptom is a marked dyspnœa, which rapidly becomes aggravated to such a degree as to actually endanger life by suffocation, and may terminate fatally in a few hours. When the children are already large enough, and when their strength allows them, they will raise themselves and sit upright in bed, in order to acquire the utmost dilatation of the thorax possible. Small children while in the recumbent position are seized with severe fits of suffocation, rendering it necessary to raise them up immediately. The breathing is extremely rapid, gasping, and rattling, and the voice grows low and indistinct. The cough is loose; older children produce also a little white foam at the mouth. The pulse is very small, but, as regards the number of beats, stands in no relation to the frequency of the respiration.

In extensive œdema the physical investigation gives a less sonorous but never a completely dull percussion-sound. As œdema of the lungs is mostly bilateral, and the dulness not very intense, percussion therefore often furnishes no very satisfactory information concerning the existing alteration of the lungs. Auscultation is of greater importance. Extensively-diffused, moist, sibilant râles are heard over the œdematous places, which the practised ear readily distinguishes, by the coarser and less regular sound, from fine crepitation of pneumonia. They are often drowned by the large sonorous râles produced in the larger bronchi by the accumulation of mucus within them, but these, after a violent cough, momentarily disappear. If a hand is laid upon the chest, it will feel these rhonchi extremely strong, while crepitation usually is not perceived by palpation. It is very difficult to distinguish pneumonia from œdema of the lungs, especially in those acute cases of œdema where it is attended by active fever. The dyspnœa, if possible, is even greater in œdema than in inflammation of the lungs, but the physical examination supplies no characteristic differences; the only symptom that tends to make the existence of œdema tolerably certain is the bilateral appearance of crepitation, while lobar pneumonia very generally is only observed on one side.

The prognosis, if the cause of the condition is not due to cardiac disease nor to a chronic disease of the lungs, is not so unfavorable as the first impression would lead one to suppose. Children attacked by nephritis and consecutive œdema of the lungs, after scarlatina, frequently suffer from the most intense dyspnœa, their faces are disfigured by swelling, and one supposes that a speedy end may be prognosticated with certainty; but after a while they rally somewhat, the albumen and casts in the urine diminish, and at the same time the urine is voided in increased quantities.

Treatment.—For nephritis after scarlatina as a cause of this pulmonary affection, the antiphlogistic treatment, with calomel, purgatives, and abstraction of blood, has proved itself to be decidedly injurious. The dyspnœa of older children may indeed be rapidly relieved by venesection, but it soon becomes as torturing as before, and, anæmia now having become superadded, the condition will be found to be vastly aggravated. A large number of dry cups applied to the back and breast mitigates the dyspnœa very considerably, and this remedy may be repeated once or twice daily without any harm or special annoyance. The utmost attention is to be paid to the state of the skin, which should be made to act energetically. The best means by which to accomplish this purpose is to wash it with a highly-diluted solution of lye. The secretion of urine, according to the observations which I have hitherto instituted, is not stimulated by any remedy so well as by the widely-known and popular roob * juniperi, of which half a teaspoonful may be given once or twice daily. It has also the advantage of having no unfavorable effect upon the appetite and stools, and that, mixed with syrup or honey, children are able to take it for a long time. The other diuretics, squills, digitalis, and acetate of potash, taste badly and their use is attended by numerous concomitant disagreeable effects, and therefore they are much less appropriate than *roob juniperi.* In the higher grade of dyspnœa an emetic of ipecacuanha and tartarized antimony often performs very efficient service.

(6.) HÆMORRHAGE FROM THE LUNGS (*Hæmorrhagia Pulmonum —Hæmoptysis*).—Three kinds of bleeding from the lungs are known to occur in the adult—either in the form of bloody sputa for a long time, or the blood suddenly bursts out from the mouth and nose in a stream, or the patient sinks down in a state of unconsciousness, and, after he has regained his faculties, is seized with coughing up of blood. In children, so far as I am aware, the second form only occurs, and is a complication of two very different conditions, whooping cough and tuberculosis. In some epidemics of pertussis, large quantities of blood are very frequently poured out from the mouth and nose, but the invariably favorable course, the absence of consecutive

* See note on page 223.

bloody sputa and all other bad effects, give rise to tolerably well-grounded doubts whether the blood does actually come from the lungs, or whether it is not merely the effect of the violent paroxysms of cough, and comes from some small lacerated vessels or capillaries in the larynx. The last of the two just-mentioned sources seems to me, in fact, to be the most probable.

Pulmonary hæmorrhage of tuberculous children is exceedingly rare. One may see hundreds of them perish from phthisis pulmonalis without meeting with a single instance of hæmoptysis, and where it does occur it is not always seen at the commencement of the tubercular process, but as a closing scene a few days before death. I have never yet observed it in infants, and only once in older children, and that was in a girl ten years old.

The treatment of hæmoptysis, as an effect of pertussis, may be found in the section devoted to that subject. That occurring in tuberculous children is only symptomatic, and consists entirely in the administration of small doses of narcotics to palliate the cough, and for the purpose of procuring euthanasia.

(7.) HÆMOPTOIC PULMONARY INFARCTION.—This morbid lesion of the lungs, first accurately described by *Laennec*, is not very unfrequently observed in the autopsies of children who have perished from purpura or pulmonary tuberculosis, and is even found in the new-born child, but in the latter it is generally complicated with pyæmia and the formation of emboli in the lungs.

Pathological Anatomy.—In one lung, and sometimes in both, reddish-black spots, of the size of a pea up to that of a walnut, are found, which are sharply defined from the rest of the pulmonary tissue, and of decidedly greater resistance. The cut surfaces are not dry and smooth, but slightly granular, and the portions of the lungs thus altered are almost as friable as the hepatic parenchyma. The cause of this darker color and augmented resistance is to be found in an extravasation of blood, which has filled up a large number of alveoli, and compressed the interstitial substance. The slightly-granular appearance of the cut surfaces is also explained by the circumstance that the coagulated blood represents a precise cast of the cluster-like arrangement of the alveoli. On scraping such a cut surface with the back of a scalpel, a bloody fluid, mixed with fine, granular blood-coagula, is obtained.

There is great danger of confounding this condition with croupous pneumonia. But, if due attention is given to the circumscribed form of the hæmoptoic infarction, its dark-red color and sharp boundaries, and the dark-red granular serum, which may be scraped off the cut surfaces, it will then hardly be possible to entertain any doubt in regard to the nature of the lesion. When these infarctions have become developed between dark-red hypostatic congested tissues, behind and below for instance, the distinction of color is then lost; still, the greater compactness and fragility, likewise the absence of air-bubbles, supply sufficient cardinal points. Hæmoptoic infarctions are oftener central than peripheral, and, in the latter case, glisten through the pleura. The bronchi leading to them, up to a certain grade, are filled with coagula; the blood, however, generally does not extend very far upward, and consequently no bloody sputa are expectorated.

This condition, according to *Rokitansky*, is often attended by active softening of the right side of the heart, and in severer forms may become complicated with rupture of the pulmonary tissue, when large cavities may be seen filled with blood and loose pulmonary substance. According to the same author, it is also possible for a retrograde development to take place, the infarction either becoming liquid, and assuming a blackish-brown, or rusty and wine-yeast-like color, and thus partly absorbed, partly expectorated by the bronchi, or the coagulated blood shrinks and is metamorphosed into an obsolete fibrous or brown amorphous tissue. In grave instances, the infarction may also become gangrenous, and then present the signs of a perfect gangrene of the lungs.

Symptoms.—Hæmoptoic infarction is never idiopathic, but always complicated with purpura, tuberculosis, and cardiac affections; in all cases the dyspnœa and fever become vastly aggravated by its appearance. Neither by physical examination, nor by any symptoms otherwise developed, are we able to distinguish this condition from lobular pneumonia. Most of the physical signs are devoid of importance, for the reason that the infarction usually occurs about the roots of the lungs, and not on their periphery. A special treatment in a malady so deficient in diagnostic symptoms as this, is, of course, impossible.

(8.) GANGRENE OF THE LUNGS (*Gangræna s. Mortificatio Pulmonum*).—Gangrene of the lungs is an exceedingly rare affection in children. It occurs after traumatic pneumonia, produced by foreign bodies, which, during a forced inspiration, have found their way into the lungs, and in the malignant course of acute exanthemata, in noma, in abdominal typhus fever, in pyæmia, and, lastly, as an unfavorable termination of hæmoptoic infarction.

Pathological Anatomy.—Since *Laennec's* time a *diffused* and a *circumscribed* gangrene of the lungs have been distinguished.

The characters of the diffused are: Spreading of a dirty-greenish or brownish-colored putrid slough over larger portions of a lung, over one lobe, or an entire lung, or the tissues, having become totally liquefied, have a gangrenous odor, and are infiltrated with a flocculent, frothy, gangrenous-odored ichor. This kind of mortification is nowhere strongly defined, but gradually merges into healthy structures, larger or smaller streaks of œdematous tissue being interposed between the gangrenous and sound portions of the lung. It is very rarely observed alone, but generally associated with circumscribed gangrene.

Circumscribed gangrene is oftener met with than the preceding. In this process, a small portion of the tissues at one place becomes transformed into a greenish-black, moist, not easily-lacerable crust or slough, which is sharply defined. In the infant, the size of this slough rarely reaches that of a walnut. After a while this gangrenous plug becomes detached from its normal surroundings, and lies in an excavation of gangrenous pulmonary parenchyma, and bathed by a gangrenous ichor; or it soon dissolves into a sanious, ichorous fluid, and is surrounded by a sloughing excavation, with irregular, shaggy walls. Its site is oftener on the periphery, and in the lower lobes, than in the centre of the lung, and, after it becomes detached, it will drop into the pleural sac, if the pleura is not implicated and firmly united with the costal pleura. This accident results in an ichorous pleuritis, and pneumothorax becomes developed.

The pulmonary tissue surrounding the gangrenous plug is either only œdematous or pneumonic to variable extents; in both instances there is a disposition to assume a diffused mortification, and thus, if the children have lived long enough with this dreadful disease, an entire lobe may be found transformed into a pultaceous, sanious mass. If the arteries coursing through the affected places do not become completely occluded by thrombi, serious hæmorrhage may ensue, the blood escaping by the bronchi, while that which accumulates in the gangrenous cavities tends to increase the gangrenous material. No recovery from traumatic gangrene of the lung has been ever observed.

Symptoms.—The symptoms vary according to the cause of the gangrene. In typhus fever, in noma, and malignant measles, the general disease is so severe, and the susceptibility to the pain, at the same time, so diminished, that no subjective symptoms whatever, and only a few objective symptoms, become noticeable, while traumatic gangrene begins with the symptoms of pneumonia. I once met with such a case, in which a boy, fourteen years of age, had a grain of corn in his mouth, and, from some cause or another, suddenly commenced to laugh, during which the grain slipped into his larynx. For several days thereafter he was still tolerably well, and it was supposed that he was mistaken, and that he had swallowed the corn. But all the symptoms of pneumonia at length suddenly came on, but did not run the regular course. The sputa became gangrenous, and, through violent paroxysms of coughing, the patient expectorated portions of the grain of corn, and large quantities of sloughing shreds, whose odor contaminated the atmosphere of the room to an unbearable degree. This expectoration continued for several weeks, and did not stop completely until after many months. The boy was reduced to a mere skeleton, and a cavity in the lungs remained, which gradually has diminished in size, and now, after six years, is barely traceable. Many years elapsed before he regained his former health and appearance. This case of gangræna pulmonum is the only one that I have seen terminate favorably.

In the other, non-traumatic, cases of gangrene of the lungs, the disease makes its appearance by a sudden aggravation of the general condition, in which the face, in particular, quickly becomes changed, assumes a leaden hue, and a distorted Hippocratic *facies*, and the pulse becomes extremely small and rapid. The temperature of the skin is not increased; the putrid odor from the mouth is always the most pathognomonic sign, which cannot be attributed to any morbid alteration in the mouth. The physical investigation may prove barren of results, if the process is central, or there be feebly circumscribed dulness, crepitating râles, bronchial breathing, and sibilant râles, or when perforation of the lungs occurs, and signs of pneumothorax appear. Generally, the sputa are bloody, the cough is intense and spasmodic. Colliquative sweats, hectic fever, and delirium, soon become superadded, after which death almost invariably closes the scene.

Treatment.—Where death appears to be inevitable, any rational treatment must be doubtful. The recoveries observed hitherto have been achieved by a treatment with quinine, mineral acids, acetate of lead, chlorine and its preparations, and, finally, with creosote.

(9.) TUBERCULOSIS OF THE LUNGS AND BRONCHIAL GLANDS.—Since we intend to subject the dyscrasiæ, as collective diseases, to a detailed discussion in a special section, it will be sufficient, for the sake of completeness, to speak here of the pathological anatomy and symptomatology of pulmonary tuberculosis, while the etiology and consideration of the general disease will be treated of along with the dyscrasiæ.

Pathological Anatomy.—All kinds of tuberculosis occur in the infantile lung. Thus there is (1), the discrete or miliary tubercle; (2), the aggregated; and (3), the large cheesy tubercular infarction. All the three varieties are often met with in one lung.

Miliary tubercle originates in the pouring out of a rich fibrous exudation into the pulmonary alveoli. Usually, not many alveoli near to each other are thus involved, and still less frequently is an entire lobule. The process is mostly confined to solitary pulmonary vesicles only, and thus the name of discrete tubercle has been very appropriately selected. It occurs as a small nodule, barely as large as a pin's head, is of a grayish color, microscopically of a perfectly amorphous nature, for, with the exception of a few epithelium-cells and elastic fibres from the adjacent interstices, nothing but detritus is found. Acetic acid slowly dissolves it.

The *aggregated* tubercle consists of the same amorphous detritus as the miliary, is situated in clusters or nests, and may be found dispersed throughout several lobules and has a deeper yellowish tint. The pulmonary tissue lying between the single tubercles of such a nest is always devoid of air, solidified, and filled with exudation.

The *tuberculous infiltration* extends over large portions of the lungs, half of, or even over an entire lobe; in children, unlike adults, it occurs oftener in the lower lobes than at the apices of the lungs; has an undefined, unlimited form, and a yellow cheesy consistence. On these large tubercular infiltrations, the process of softening and degeneration can be studied to the best advantage. The tubercular mass, which has finally attained to a semifluid consistence, is evacuated by a bronchus, and a partly filled or a completely empty cavity remains, in the walls of which new tubercles may be deposited, and then, by the softening of these, the cavity is still more enlarged. Thus irregular, excavated cavities, provided with various prolongations, finally result, and are filled up with a dirty crumbling, yellow, or gray pus. Sometimes several small ones, then again a single one, so large as to occupy the whole lobe, may occur. In this connection it may be well to remark that a cavity seldom encroaches upon the adjacent lobes, but always leaves the demarkations naturally existing between them uninjured. Large caverns always communicate with some bronchus, whose open mouth is seen sharply cut off and adherent to the walls of the cavity. Occasionally obliterated vessels, or remnants of parenchymatous tissue, run like strings or bridges across the cavity. These vessels, however, invariably seem to be obliterated, for hæmoptysis is so extremely rare in children as nowhere to be mentioned as ever having been observed. So, too, the rupture of a cavern into the pleural sac, with pneumo-thorax resulting therefrom, so far as I am aware, never occurs in tuberculous children. That the pulmonary parenchyma surrounding a cavity is never perfectly normal, but always solidified like cicatricial structures, or in a state of gray or red hepatization, containing more or less tubercles, is well known. Œdema is also frequently met with, especially in the lower lobes, while a vicarious emphysema usually involves the upper lobes. The bronchi which communicate with the cavities contain a yellow, crumbling pus like that found in the caverns, while the rest exhibit a swollen and injected mucous membrane. According to *Hasse*, the branches of the pulmonary artery leading to the tubercular cavities and infiltrations become obliterated, but new ones are formed in the parts of the lung that have suffered a loss in their principal vascular network. This increased vascular supply comes from the bronchial arteries and in part from the intercostal, the blood being carried off again by the bronchial veins and vena azygos. A disturbance of the circulation ensues, with which the partial dilatation and unusual development of the subcutaneous veins may have some connection.

Cavities, as is well known, may heal by calcification or by cicatrization. For both methods of healing, a number of years of time is undoubtedly necessary, and this readily accounts for the rarity with which they are observed in the autopsies of infantile cadavers. Calcification never occurs in children; dense, puckered places, on the other hand, are often seen conjointly with still-existing cavities, and are, most probably, to be regarded as the cicatrices of smaller cavities. The tubercular lung of an infant is distinguished from that of the adult by the absence of pigmentation.

The *bronchial glands* are much more frequently the site of tubercles than the lungs. This is invariably the case when tuberculous degeneration exists in the lungs; but often, even where they are not implicated. Here the large yellow tubercle principally occurs, while the aggregated clusters of small tubercle are rarer, and the miliary variety is scarcely ever observed.

Generally, the whole gland degenerates into a large yellow tubercle, and attains to the size of a small hazel-nut, and even to that of a walnut. The tuberculosis mostly implicates several glands, so that the bifurcation of the bronchi becomes surrounded by a large tubercular mass. Only those glands lying external to the lungs attain to a considerable size: those accompanying the bronchi within the lungs barely become larger than an almond, or dispose themselves in semilunar channels about the bronchus. The glandular parenchyma, as a rule, has wholly disappeared, and nothing but a capsule, the former enveloping membrane of the gland, remains, to which a yellow tuberculous mass adheres all around. These seem to be less disposed to softening; remarkably seldom, at all events, are soft tubercles found in the glands, but, when that process does take place, it may begin in the centre as readily as at the periphery. In older children a partial calcification may also occur. The influence of the tuberculous bronchial glands upon the adjacent organs is twofold, as *Rilliet* and *Barthez* very correctly have pointed out. They say that glands act either (1) by compression, or (2) by firm adhesions with the contiguous organs and consecutive perforation.

(ad 1.) Anatomists divide the glands that are situated external to the lungs into (*a*) tracheal glands at the side of the trachea down to its division; into (*b*) bronchial glands, lying between the bifurcation; into (*c*) cardiac glands, lying upon the base of the heart and large vessels; and into (*d*) œsophageal glands, within the mediastinum posticum, in the neighborhood of the œsophagus. All these glands may undergo tuberculous degeneration and enlargement, and then press upon the adjoining organs.

As regards the compression of the vessels, we find those which are liable to it to be the superior vena cava, the pulmonary artery, the pulmonary veins, and the vena azygos. Instances of the total obliteration of these veins by this means are recorded. I myself have never met with such, but only remember to have seen a constriction of a pulmonary vein with simultaneous tubercular degeneration of the bronchial glands. Compression of the vessels may give rise to hæmorrhage and œdema. Thus, for example, according to the authors above quoted, compression of the vena cava superior produced a hæmorrhage into the arachnoid sac, and œdema of the face. Pressure upon the pulmonary vein may very readily cause œdema of the lungs.

Impressions upon and flattenings of the trachea and its bifurcation are sometimes found, and are also produced by tubercular glands. They are not, however, capable of effecting any decided diminution of their calibre. Compression of the nerves is of greater importance, especially of the pneumogastric nerve. Sometimes the glands grow so closely around them, that it becomes an actual impossibility for the anatomical knife to separate them. Nevertheless, the nervous function does not seem to be interfered with, for, were it otherwise, more marked disturbances of the circulation and of the respiration would be observed in glandular tuberculosis than is actually the case. Compression of the œsophagus seems to occur but very rarely; a simple lateral displacement is sometimes observed.

(ad 2.) The bronchial glands within and outside of the lungs may become intimately united with the bronchi, and perforation of the walls of the bronchi may ensue from the softening that follows. According to *Rilliet* and *Barthez*, non-softening, hard, tubercular nodes are also capable of producing ulceration of the rings of the bronchi, and thus occasion perforation, a condition that has hitherto received but little attention from the pathological anatomist. In the lung itself it is very difficult to distinguish a cavity from a perforated bronchus in a suppurating bronchial gland. These pseudo-cavities are always situated near the roots of the lungs, and outwardly their excavations are in connection with the rest of the tuberculous masses of the degenerated glands.

The authors referred to also speak of a tuberculous perforation of the pulmonary artery, and of the œsophagus, of which I have no personal experience.

Symptoms.—First of all, as regards the physical examination, it is important to understand that the percussion should be performed lowly; and the strokes follow each other very slowly, for otherwise the less-marked dulness will invariably be overlooked. In miliary tuberculosis, where both lungs are equally permeated by the minute tubercles, percussion, of course, affords less information; the percussion-sound in general is a little more tympanitic, but no inequality in the two pectoral moieties can be detected. The same holds good with tuberculosis of the bronchial glands, which are overlapped by the lungs and roots of the large vessels, and thus totally escape the physical diagnosis. On the other hand, extensive tuberculous infiltration may very readily be detected by careful percussion, but, as has already been stated, when treating of the pathological anatomy, the apices of the lungs are not so exclusively the site of these infiltrations. A circumscribed dulness is very frequently found farther down or laterally, which is also referable to tuberculosis, although in adults it seldom occurs in this manner. If caverns have already formed and evacuated their contents by the bronchi, the flat percussion-sound becomes a little more sonorous, and acquires a tympanitic pitch, a condition that by no means indicates improvement nor diminution of the tuberculous infiltration.

Nothing characteristic is detected by auscultation; the bronchial catarrh always attending upon this disease gives rise to far-diffused, large and small sibilant râles, which differ in no respect from those of a simple bronchitis. In large tubercular solidifications of the pulmonary substance there is always bronchial respiration, strong consonance of the voice and of the cough, and distinct abnormal propagation of the cardiac sound to parts of the lungs at a distance from the heart. Occasionally crepitating râles, or merely roughened respiration, is heard at the margin of the dulness. The cardiac impulse is remarkably strong in all tubercular children. When a solid tuberculous infiltration liquefies, and cavities are formed, the auscultatory symptoms likewise become changed, as has already been pointed out when treating upon percussion. Cavernous gurgling and râles now supervene, and the breathing becomes cavernous. Cavities, however, in small children, as a rule, are not of such a size that these symptoms should always appear, and be perfectly characteristic.

As regards the functional symptoms, these will be found to be of various descriptions. The *respiratory acts* are almost always accelerated, most rapidly in febrile, acute tuberculosis, where the two factors, (1) the fever, and (2) mechanical obstruction in the air-passages, act in combination. They then rise from sixty to eighty in the minute. In chronic tuberculosis the acceleration is barely perceptible, and scarcely any dyspnœa is present. But, in the rapidly-developing and progressive form, great dyspnœa, even orthopnœa, and labored breathing, participated in by the alæ nasi, may become superadded. This, however, is to be ascribed more to the concomitant pleuritis and partial tuberculous pneumonia than to a constriction of space, in consequence of the tuberculous deposit. In general it may be assumed that the more acute and diffused the process in the lungs, the more accelerated and embarrassed are the acts of respiration.

The *cough* is the most constant of all the symptoms, for it is never absent altogether; it is feebler and less noticeable in acute miliary tuberculosis, where the same process in other organs, particularly in the brain, reduces the irritability of the nervous system to such an extent that these hydrocephalic children often will not cough for many days, although the *post-mortem* examination may show that both lungs are found permeated by miliary tubercles, and the bronchial glands metamorphosed into cheesy masses.

The cough is not only the most constant, but also the earliest of all the symptoms. It never ceases completely during the entire course, although there may be short remissions which are liable to mislead one to the formation of a deceptive prognosis. At first it is dry, short, and hacking, but recurs frequently; later, when large extents of bronchi are implicated, it becomes moist, and is attended by convulsive paroxysms. These paroxysms have great similarity to those of whooping-cough, but the characteristic, loud, and prolonged inspiration at the end of the cough is always absent; nor does the expectoration of large quantities of glairy mucus set in after several weeks. These spasmodic coughs, as a rule, have their foundation in the tuberculous enlargement of the tracheal glands, which exercise a constantly-increasing pressure upon and irritation of the trachea, and consecutively upon the larynx. It may also be occasioned by profuse secretion alone, as is often enough observed in adult patients suffering from simple broncho-blennorrhœa. When the latter cause exists, the paroxysm ceases as soon as the mucus has passed the larynx, but this cannot be so easily decided in children, since they immediately swallow it. In tuberculosis of the bronchial glands, on the other hand, the paroxysms may continue for an indefinite time, and exist without any expectoration, and, as a rule, cease only when the exhaustion has become extreme.

The *expectoration*, which in adult tuberculous patients supplies such an excellent index, cannot be relied upon at all in children up to the fifth or sixth year, for they invariably swallow the mucus coughed up from the larynx. But occasionally, even in young children, after a violent paroxysm of coughing, a white, fine-frothy foam will be seen to rise to the tongue, and even between the lips. This, however, can only be regarded as simple secretion of the bronchi affected with catarrh, and is by no means pathognomonic of tuberculosis. Children over seven years old, in whom, before the age of puberty, phthisis pulmonalis is very rare, expectorate like adults, and the pus evacuated from the vomicæ is in all respects similar. The rare occurrence of hæmoptysis has already been particularly mentioned, in connection with hæmorrhage of the lungs generally, on page 306.

If the children are large enough to indicate the place where they feel the pain, they will almost always describe its site to be at the præcordia or the sternum, only extremely rarely in the lateral parts of the thorax. It is absolutely necessary to ascertain whether any pains more or less violent exist, for the purpose of instituting a scientific treatment, for the more intense they are, and the greater the restlessness occasioned by them, the more rapidly the children sink. As tuberculosis is seldom limited to one lung, the alterations observed in the decubitus of such children are, therefore, less constant. They mostly lie on the back, and only very seldom choose a constant lateral decubitus. It is remarkable that, notwithstanding the extreme emaciation, the long duration of the disease, and of the continued fever, they rarely and only at a late date get bed-sores. The walls of the thorax exhibit a degree of emaciation disproportionate to that of the rest of the body, and a development of the subcutaneous veins takes place, and may be regarded as characteristic of tuberculosis. These veins, especially in the neighborhood of the sternum, from the first to the third rib, become largely dilated, and may swell up to the width of one line.

In all chronic diseases in which any impediment to the circulation of the blood exists in the lungs, consequently in extensive tuberculosis and cardiac affections in particular, a peculiar bulbous swelling of the tips of the fingers is observed, by which the nails become curved forward like claws. In the highest grade of this curving the fingers acquire the appearance of drumsticks. In this we possess a very valuable sign, because this bulbous thickening of the ends of the fingers is never congenital, and is never observed in healthy children, but always denotes the existence of a high degree of stasis in the right side of the heart, which, as a rule, has its cause in the lungs.

Markedly enlarged bronchial glands, as has already been observed in speaking of the pathological anatomy, sometimes give rise to œdema of the face—a condition that is to be ascribed to local disturbances of the circulation, because, in dropsies originating in the dyscrasiæ, the feet are well known to swell first, and œdema of the upper extremities and of the face does not supervene until a long time afterward, while in this case that of the face alone is present. *Rilliet* and *Barthez* have shown, by several dissections in such cases, that compression of the vena cava by the enlarged glands has actually taken place. There is then also found a marked dilatation of the subcutaneous veins of the neck, and slight cyanosis of the lips and eyelids.

Pulmonary tuberculosis runs its course either as acute miliary tuberculosis, in which case the same process is also found established in other organs, especially in the brain and upon the peritonæum, and the various symptoms emanating from the other organs, completely overshadowing those of the lungs, or it runs a chronic course as in the adult, under the signs of phthisis pulmonalis. The first form will be discussed once more in speaking of the cachexiæ; the second has a duration of from two months to two years, and may also be arrested. I know children, the progeny of demonstrably tuberculous parents, who, in the early years of life, exhibited decided signs of developed pulmonary tuberculosis, such as distinct dulness over one or the other part of the thorax, bronchial breathing, sibilant râles, intense protracted bronchitis, emaciation, fever, etc., and nevertheless recovered, to all appearance, completely: the nutrition became reëstablished, the appearance of the child blooming, the fever and cough gradually subsided; but the dulness remained, and, with the least disturbance of the general condition, a new and obstinate bronchitis always recurred. But finally, in some cases, the process becomes general, and then the phthisical children perish under the symptoms of miliary tuberculosis.

In regard to the treatment, the reader is referred to the precepts which will be recommended for tuberculosis in the section on the dyscrasiæ.

(10.) Carcinoma of the Lungs and of the Mediastinum Anticum.—Carcinoma in general is an extremely rare affection in children, and that of the lungs in particular has been observed but a few times. In most instances carcinoma of the lungs was found in the cadaver, along with cancerous deposits in other organs, in the form of white or grayish-red nodules of the most variable sizes. They are situated both in the deeper portions and upon the periphery of the lungs; they are flattened down when deposited close to the pleura, and, like cancer of the liver, become umbilicated in the centre. The symptoms observable during life are reduced to bronchitis and dyspnœa, and are usually supplanted by those of carcinoma in other organs.

Carcinoma of the *mediastinum anticum* I have observed twice—once in a boy five years of age, and once in a boy six years of age. Since, in both cases, the whole anterior mediastinum was filled up with it, and the pleura, lungs, and pericardium were united by it, a description of the symptoms at this place will therefore not seem improper.

The development of this carcinoma seems to be tolerably rapid; at any rate, both of these children manifested the signs of embarrassed respiration for a few weeks, and yet, at the percussion that was soon after performed, a marked dulness was already observable over the sternum, extending laterally to both sides of it. The main index is, therefore, the aforesaid dulness, which, in the course of the malady, rapidly increases, not only by the growth of the carcinoma, but also by the dropsical effusion which is poured out into the pleural sac. That the exudation which gives rise to the dulness is not of a fluid nature, may be very easily demonstrated. The cardiac sound is heard over it almost as loudly as when the heart itself is auscultated; the sibilant râles, too, originating in the catarrhal bronchi, are distinctly audible over the cancerous tumor. The functional disturbances mainly depend upon the direction in which the cancer has most extended. The large venous trunks must have been compromised in both the cases I saw, for œdema of the face and hands was present, and the veins of the neck were markedly dilated. The children suffered from constant orthopnœa, on account of the extremely distressing compression of the anterior sections of the lungs, and breathed easiest when they curved the back and flexed the head forward, which attitude was also retained during sleep. The dorsal surface of the thorax gives, in these cases, a sonorous tympanitic percussion-sound, and, as this part of the lung must perform a double duty on account of the compromised anterior portion, the respiratory sounds are heard extremely intensified, and frequently masked by sibilant râles. The heart is displaced outwardly and downward, and, in one of the cases I saw, a blowing systolic murmur was heard without any material alteration of the heart or its valves being found at the autopsy by which that murmur could be explained. The pulse is very much accelerated, the appetite not wholly gone, and the emaciation, consequently, never becomes so extreme as in tuberculosis. Finally, much to the relief of the patients and of their relations, the brain also becomes affected, coma or delirium supervenes, and the patient soon succumbs.

At the autopsy I found, in one case, a medullary carcinoma, which filled up the whole anterior mediastinum, and extended over the anterior part of the right lung, without having occasioned secondary nodules in any other organ. In the second case, a cystosarcoma, of the size of a large fist, simply compressed, but did not involve the lungs and heart. In both, marked hydrothorax, but only slight ascites, were present.

The dyspnœa of these children, which was extremely distressing to themselves, and for others to witness, could temporarily be mitigated in a very surprising manner by large doses of morphia, gr. $\frac{1}{8}$ to $\frac{1}{2}$ pro die.

(11.) WHOOPING-COUGH (*Tussis Convulsiva—Pertussis*).—Whooping-cough is an epidemic, contagious bronchial catarrh, with peculiar convulsive paroxysms of cough. *Hippocrates* has not described it accurately. The delineations of the epidemics of the former centuries are not exactly applicable to the group of symptoms as it is now observed, and only since the eighteenth century have more correct views been entertained in regard to this disease in the different countries where it has prevailed. Besides the denominations above given, it has received a number of others, such as coqueluche, *affection pneumo-gastrite-pituiteuse*, *broncho-céphalite*, *catarrh convulsif* (in France); chin-cough (England); *pertussis*, *tussis suffocativa*, *spasmodica*, *strangulans*, *clangosa*, *ferina*, blauer Husten (blue-cough), Schaafshusten, Eselshusten (Germany). We have to deal here with no simple anatomo-pathological alteration, but with an acute cosmical disease, and, in fact, from the class of the so-called atmospheric pestilences.

Symptoms.—Three stages of whooping-cough can be distinguished with tolerable accuracy—(1) a stadium catarrhale, (2) a stadium convulsivum, and (3) a stadium decrementi.

(1.) *Stadium.* The phenomena of the *stad. catarrhale*, or prodromorum, or invasionis, are those of a simple bronchial catarrh, sometimes complicated with gastric symptoms. Some hoarseness, tickling of the throat, dry cough, sneezing, profuse flow of mucus from the nose, lachrymation and redness of the eyes, are together or singly observed in almost every child with commencing whooping-cough. If febrile symptoms supervene, as frequently happens, such as hot skin, frequent pulse, depression, general *malaise*, and loss of appetite, then we have a perfect picture of the stage of incubation of measles, a fact which, when whooping-cough and measles prevail simultaneously in one place, we shall do well to keep in mind, on account of its bearing on the prognosis. The cough, from the very commencement, assumes a peculiar, hollow, metallic clang, soon becomes paroxysmal, and, if no preëxisting pulmonary affections are present, is always totally dry. This stage lasts from three days to three weeks, is more or less distinctly marked, and can be observed in every case of whooping-cough.

(2.) *Stadium.* The *stad. convulsivum* or *nervosum* is distinguished by the cough recurring in violent paroxysms, and which is of such a peculiar character that it is never forgotten again when it has once been heard. Somewhat older children have a premonition of the occurrence of the attack. They experience a tickling sensation in the throat, oppression of the chest, feel nauseated, breathe anxiously and quickly, sit upright in bed, or run, when they are awake, to a chair or some other support, in order to be able to offer a stronger resistance to the attack. The paroxysm itself consists of a great number of short, rapidly-recurring, not perfectly uniform, spasmodic coughs, and is at length interrupted by a protracted, whistling, sipping attempt at inspiration. The French designate this whistling inspiration by the word "reprise." Immediately after the first one, the convulsive expirations begin anew, last ten to fifteen seconds, whereupon another "reprise" follows, and thus these two acts alternate with each other several times in such a manner that an entire paroxysm, from the beginning to the reappearance of the normal respiration, may last from one to fifteen minutes. At the beginning of the paroxysm, the single cough-exclamations follow each other with the greatest rapidity, and without any intervals, and the child seems to be in imminent danger of dying by suffocation. And in fact, during the fit of coughing up to the "reprise," no air whatever gains entrance into the lungs, a fact of which one can easily convince himself by auscultating the dorsal surface of the thorax. At the "reprise" the glottis is evidently in a state of momentary constriction, either in consequence of spasm, or of paralysis, as has been already more thoroughly explained during the study of croup, and all the auxiliary respiratory muscles of the neck and abdomen are called upon to perform an active part. Serious stagnations of the circulation are produced by the choking acts of coughing; the blood stagnates in the pulmonary artery, and then occasions dilatation of the right side of the heart and of the entire peripheral venous system, a condition that is especially distinctly to be seen in the large veins of the neck. Finally, the children become bluish red over the entire head and face, from which also the designation of "Blauhustens" (blue-cough) has originated. The eyes become injected, and protrude somewhat from their sockets. The face swells up, and is covered with a cold perspiration; the movements of the heart and of the pulse are feeble and unequal; the urine and fæces are often involuntarily ejected by the violent contractions of the abdominal muscles; hernia and prolapsus of the rectum are also sometimes occasioned thereby. The venous stasis gives rise to frequent hæmorrhages; the most common are those from the mouth and nose. Whether the larger quantities of blood vomited and coughed up come from the lungs, as some believe, is very questionable, because very often no consecutive alterations of the lungs whatever, and no aggravation of the general condition, ensue therefrom, and a perfectly colorless mucus is expectorated in the paroxysms of cough that come on a few minutes thereafter. We know, however, that after an hæmoptysis, for instance in tuberculosis, the sputa continue to be bloody for several days. Extravasations of blood upon the conjunctiva bulbi, or into the loose cellular tissue of the eyelids, frequently take place, where the extravasated blood undergoes the same changes of color that we observe in external injuries. *Bouchut* relates a case where a child cried with real bloody tears, and states also that the hæmorrhages in pertussis may sometimes become so profuse as to endanger life, an occurrence that I have never yet experienced. So, too, the bleedings from the ears, of which mention is made in most of the text-books, I have never observed; nevertheless I do not doubt that they have been seen, especially in cases of otorrhœa, and ulcerations of the external meatus. *P. Frank* reports a remarkable case of a patient who was obliged to sneeze one hundred times or more at every paroxysm. Nervous children may be seized with general convulsions during these paroxysms of cough.

Vomiting usually forms the *finale* of every paroxysm, which, at the beginning of this second stage, only results in the expulsion of a little mucus, while much liquid food and gastric juice are thrown up. The longer the whooping-cough has lasted, and the nearer it approaches to the third stage, the more profuse becomes the secretion from the bronchi, and, finally, with every paroxysm of cough, partly by the act of coughing, and partly by the act of vomiting, a large quantity of colorless, tenacious mucus is expectorated.

When the attacks are of much duration, protracted for ten to fifteen minutes, the children feel very much exhausted after them, complain of pain in the breast, breathe for a long time anxiously and hurriedly, and, finally, fall asleep. Generally, however, when the paroxysms are only moderately severe, they forget their sufferings immediately after they have ceased, and, to the great surprise of their inexperienced parents, resume their play, or even their meals. Simple pertussis is unattended by fever, but the supervention of fever and anorexia always indicates a complication.

The number of paroxysms in the twenty-four hours varies from four to sixty; generally, however, not more than eighteen to twenty-four occur during that period. No regularity in the successions, nor equality in their intervals, is ever to be observed. They are more violent, and occur oftener in the evening, when, generally, various external exciting causes, such as heating, mental excitement, eating and drinking, coöperate. The attacks come on either wholly spontaneously in children who maintain a perfectly quiet attitude, or they are induced by crying, mental excitements of all kinds, laughing, swallowing, particularly the swallowing of dry, irritating morsels, cold or impure air, etc. When several children affected with whooping-cough are together, and one of them begins to cough, the mere sight will, in most instances, infect the rest, and soon all join in this most distressing concert.

In healthy children, and under favorable circumstances, this stadium lasts four weeks, but it may, under other circumstances, be prolonged for eight weeks, or more. A remission in the severity and frequency of the paroxysms, attended by an augmentation of the secretion, indicates a speedy transition to the third stage.

3d Stadium. In this stadium *criticum, s. decrementi*, the paroxysms of cough have lost their severity. The paroxysms are not so long, and the acts of coughing not so rapid; the "reprise" ceases entirely, and, although retchings may still be present, no liquid food is vomited, the vomited matter consisting of an enormous quantity of bronchial mucus. This mucus is mostly yellowish or greenish colored, and, with every attack of coughing, nearly a tablespoonful is expectorated. About this time nocturnal perspirations become superadded in most of the children, and sometimes an eczema also breaks out. In healthy children, when the cough has reached this stage, it will cease completely in from two to three weeks, but in tuberculous and scrofulous children, on the contrary, it may still last for many weeks. In this stage, short relapses often also occur, and the patient is thrown back into the second stage; but, generally, these relapses are of short duration.

The complications of this disease are numerous, and, generally, they are of a dangerous character.

The most frequent complication liable to occur is an affection of the pulmonary parenchyma, which may very readily become developed from the retention and decomposition of large quantities of bronchial mucus. It usually appears as a lobular pneumonia, only exceptionally as lobar pneumonia, and is to be dreaded in proportion to the age of the child at which it occurs—the younger, the more dangerous. Children under one year of age, who lie much upon the back, and have not muscular ability to properly cough up the mucus from the bronchi, are extremely often attacked during pertussis with symptoms of pneumonia, such as hot skin, rapid pulse, frequent, painful breathing, accompanied by a loud noise during expiration, and elevation of the alæ nasi. The paroxysms lose their characteristics, and a dry cough, combined with a painful distortion of the countenance, supervenes. Most of these children perish in a few days of convulsions and marked cyanosis. In a few solitary instances only do the symptoms of the lobular pneumonia subside and give place to the former pertussis, and, even when this occurs, there is always still the greatest danger of relapses.

Other children suffer from gastric complications. They get a coated tongue, anorexia, fever, suffer from general debility, and putrid smell of the fæces. The ulceration of the frænum linguæ, long known in Germany, is a very peculiar occurrence. *Gambarini*, of Mailand, has lately recalled the attention of the profession to it. The ulcer almost always extends in a transverse direction to the long axis of the frænum, and very often is seen in whooping-cough in children of from one to two years of age, never in very young children and seldom in older ones. It seems that this condition depends upon a mechanical cause; namely, the tongue, in the violent acts of coughing, is thrust out forcibly, and the frænum is, so to speak, sawn off by the sharp lower incisor teeth. Hence the reason why it is never met with in the still toothless infant nor in older children who have already somewhat blunted their incisors, and who are not in the habit of thrusting out the tongue during the attacks. It is, however, absent in a large number of severe cases of whooping-cough, and is also observed in children with simple bronchitis, as well as in those without any cough, in the form of aphthous ulceration, especially during dentition. This ulcer does not heal, no matter what treatment be adopted, so long as the convulsive cough lasts, but will heal spontaneously as soon as a mitigation in its intensity has taken place.

Again, in other children, marked cerebral symptoms supervene in consequence of the venous stasis; in general, however, this complication is much less frequently observed. The children become lethargic, frequently carry their hands to the head, complain of severe headache, and other similar signs, which appear to render the pertussis a secondary affair. Grating of the teeth, hydrocephalic vomiting, convulsions, and coma, finally set in, though death but extremely rarely ensues, and when it does there is found a cerebral disease, acute hydrocephalus or purulent meningitis, but which is not directly connected with the pertussis.

Other though rare complications are pleurisy, pericarditis, and pemphigus. *Jadelot* saw pemphigoid vesicles occur in numerous epidemics, and in every instance death resulted.

The most frequent sequelæ are chronic bronchitis, goitre, hernia, prolapsus of the rectum, dropsy, tuberculosis, and aneurism.

Death, as the direct consequence of an attack, is extremely rare, and notwithstanding the numerous severe epidemics that I have witnessed I am unable to recollect a single instance. On the other hand, the majority of the patients affected with pneumonia died, and children under one year of age may, even without the superaddition of an acute fever, become so atrophic from pertussis as not to be able to rally.

Whooping-cough has no power to protect its subjects from any other epidemic disease. Pertussis patients may acquire all possible diseases, acute exanthemata, intermittent fever, typhus fever, cholera, etc.; but occasionally chronic skin-disease disappears in a very remarkable manner while the whooping-cough lasts.

The diagnosis of whooping-cough is very easy to make. The cyclical course, the peculiar cough, with the prolonged, loud inspiration, the vomiting at the close of the paroxysm, and particularly the epidemic occurrence, as well as its often demonstrable contagiousness, are such constant symptoms, that their presence leads with certainty to the diagnosis. Moreover, a paroxysm may be induced at will in every child with whooping-cough, by pressing the root of the tongue with the finger, a fact which is often very advantageous for clinical purposes. The retching thus produced is almost always followed by a violent paroxysm of cough, which instantly indicates the true diagnosis where the descriptions of attendants have given no clew to it.

Pathological Anatomy.—When an apparently healthy child with whooping-cough dies in consequence of an injury or some acute disease, in the convulsive stage, the air-passages will sometimes be found injected, but sometimes again perfectly normal; but, if death occur during the last stage, the trachea and large bronchi are filled with that mucus which during life was expectorated in such large quantities. Not the least morbid alteration is to be detected about the glottis.

The bronchial glands are sometimes, but by no means invariably, swollen. Owing to the supposition, which prevailed for a long time, that a neurosis was the cause of this disease, the brain and spinal cord, as well as the pneumogastric nerves, were often subjected to a thorough examination, but this, in the majority of the cases, proved to be perfectly fruitless, and only a few investigators speak of a redness of the pneumogastric, which most probably is to be regarded as a *post-mortem* imbibition, for, on account of the rarity of the condition, it cannot be regarded as pointing to the cause of pertussis.

The most frequent consecutive effects found are lobular and lobar pneumonia, cylindrical dilatation of the bronchi, partial pulmonary emphysema, pleuritis, pericarditis, meningitis, and tuberculosis of the pulmonary and bronchial glands.

Etiology.—Whooping-cough is *contagious*, and attacks an individual *but once.* The contagiousness of a disease becomes evident when a great number of cases follow from direct contact with persons affected. This has so often happened in pertussis as to establish the fact, and therefore it is very wrong to attempt, by single cases in which no contact with whooping-cough could be proved, to maintain a spontaneous origin for the affection. Indeed, we do not know whether the contagion be not so intense as to be transmittible by a third person, an adult, for example, himself remaining perfectly well. The mild and feverless character and the long duration of the disease, in consequence of which the sick children are much upon the streets and in public places, favor contact and communication more than is the case in any other contagious disease. Most experienced and reputable physicians express themselves emphatically, that genuine pertussis attacks children only once. The assertion of a few others, who claim to have observed it twice in the same person, is probably founded upon the circumstance that some tuberculous patients suffer from pertussis-like paroxysms, or perhaps they have met with a case that, already in its decline, has suffered a relapse.

This contagious property, and the immunity following therefrom, result in rendering whooping-cough almost exclusively a disease of childhood. It very rarely occurs in adults, and then mainly among the wealthy, who have always been much separated from children, and have thus escaped infection. Nevertheless, parents of children with whooping-cough, and the nursery-maid, frequently suffer from a milder kind of spasmodic cough, which seems to be due to their being with the patient, for these persons often are not the least predisposed to a cough, and lose it as soon as they have absented themselves for some time from the infected atmosphere. Infants before the commencement of dentition are less susceptible than those several months older; still, exceptional instances of perfect whooping-cough occur in the former, which usually becomes complicated with lobular pneumonia and terminates fatally.

It is not possible to state with certainty of what kind its contagious principle is. Most probably it is confined to the particles of mucus expectorated, which, becoming dry, are diffused in the surrounding atmosphere, a supposition that also seems to be borne out by experience, for, in the last stage, children infect with greater certainty.

The stage of incubation lasts but a short time, barely ever more than three or four days.

In addition, its purely nervous contagious character, induced by simple imitation, as are gaping, vomiting, chorea, hysterical convulsions, etc., may deserve attention. The constitution, the manner of living, and the season of the year, have no marked influence upon the origin or prevention of the disease.

By its contagiousness, then, the epidemic propagation of pertussis is brought about, so that in the course of a quarter, or at the most half of a year, the entire juvenile population, or, at least, the greater portion of it, has been infected by this disease. Schools and children's hospitals are to be regarded as the most prolific channels for its propagation. In the latter institutions in particular, it will often rage for years, after it has died out in the cities, for new children are constantly admitted for surgical or other internal diseases, and then acquire pertussis.

Treatment.—The prophylaxis consists entirely in the removal of the children from the place in which whooping-cough is just appearing, for a perfect isolation is only carried out with the greatest difficulty, and never affords as good a guarantee as an actual change of place does. *Jenner* made the interesting observation, that children recently vaccinated escaped whooping-cough, and that vaccination exercised a favorable abortive influence on patients. Owing to the circumstance that we usually perform vaccination in the first months of life, and that young children are less liable to sicken with pertussis than those that are a year or more old, the contingency in which this prophylaxis is applicable is a limited one. I have as yet vaccinated only two young patients with pertussis, one of which was sick for two, the other for three weeks: in both the course was a regular one; in the first the actual paroxysms lasted ten, in the second seven days, so that, if six weeks were calculated as requisite for the full course, then quite an abbreviation of the process was effected here. The internal administration of *belladonna*, and the suspending from the neck of small bags containing various kinds of strong aromatic substances, moschus, camphor, etc., have long ago proved to be totally useless as prophylactic measures.

The rational treatment of the established disease consists in the prescribing of an appropriate regimen, in treating the individual paroxysms, and in the attempt, by the aid of proper remedies, to bring about an abbreviation of the entire process.

As regards the manner of living, that depends upon the season of the year. In winter and during the prevalence of sharp, rough winds, the permitting children with whooping-cough to go out is always hazardous, and often results in inflammatory complications; in summer, on the contrary, the subjects are most comfortable through the day when they are out in the free air. The course of whooping-cough in winter, where children are for many weeks confined to the house the entire day, and at the most are only able to go out for an hour on a warm noonday, is therefore slower, and oftener leaves sequelæ than in summer.

As regards the diet, so long as the process runs a simple, feverless course, no changes need be made, but dry bread and cake, and all kinds of dry irritating nutriments in general, are to be prohibited, because, in their passage over the epiglottis, they infallibly induce a paroxysm. When febrile complications become superadded, an antiphlogistic treatment is called for, and its character is already understood. Milk nutriments, and a plentiful supply of lukewarm milk, exercise a favorable influence in this disease, while the so-highly-recommended althæa and elder-flower teas are totally despised by most children.

Concerning the so-much-lauded change of air, a residence in the country does not by any means possess that abortive influence that is usually attributed to it; still, sometimes it works quite surprisingly when the patients are removed to the country in the last stage of whooping-cough, say, in the fourth or fifth week. The great joy attendant upon the change of place, the altered diet and manner of living, seem to at once arrest all signs of the disease, and from that time the children are not heard to cough.

But, when children who have only just contracted pertussis are sent into the country, no alteration nor abbreviation whatever is to be observed; they infect the children of the village, who may die of lobular pneumonia, and thus bring about most unpleasant consequences.

As regards the paroxysms, all exciting causes are most scrupulously to be avoided. The children should be commanded to eat slowly and quietly, they should not run nor become heated, and are to be spared all mental disturbances so far as it is possible. As the witnessing of a paroxysm will also immediately induce one in a child suffering from whooping-cough, it is therefore advantageous to separate such children whenever it is possible.

In the paroxysm itself the child is easiest with the neck flexed slightly forward, and the hands grasping firmly some stable support. In case the child droops its head too far downward, the forehead should be supported by the hand. Occasionally very severe and prolonged paroxysms may be cut short by introducing the finger far into the mouth, and thereby inducing premature vomiting. *Churchill* advises that, at the beginning of the attack, half a drachm of ether or chloroform be poured into the hollow of the hand, and held in front of the child's face. I have tried this only once, but the child was decidedly averse to the vapors, and the room smelt so strongly of chloroform the whole day that its occupants were affected with headache, and opposed to its further employment. If, at the end of a paroxysm, slight giddiness and stupor ensue, the children will be obliged to lie down for some time, and the head should be covered with cold compresses.

To enumerate all the remedies that have been resorted to in whooping-cough would consume too much space, and be of little benefit, for it is now a conceded fact that remedies, which were found to be of decided value in some epidemics, proved totally worthless in others.

The treatment by emetics has been, and still is, most incomprehensibly, much in favor. Emetics were given every day, or, at least, every other day, for one or two weeks, and it was believed that an abbreviation and mitigation of the attacks were effected. To young children the French physicians give their syr. ipecac., to the older ones vin. stibiat. The fact that those who extol these therapeutic experiments are now very materially reduced in numbers, would, of itself, dissuade me from repeating them. And, besides, to induce vomiting artificially in a disease which is attended by recurring acts of vomiting is, as it seems to me, to say the least, entirely superfluous.

Of the narcotics, *belladonna* came in use by preference, and of this remedy, in particular, has it oftenest and most strikingly been observed, that its effectiveness is decidedly different in different epidemics. Thus, *J. Frank*, for example, in one epidemic, derived beneficial effects from it, in six others none whatever. I myself can only find fault with belladonna for the inequality of its preparations, on account of which it is necessary to exercise the utmost possible caution in increasing the dose. As soon as dilatation of the pupils and irritation of the throat ensue, the paroxysms, it is true, become decidedly ameliorated; but these symptoms of poisoning are also of themselves unpleasant. They frighten the parents, and in some children, even when the use of the remedy has been suspended, complete blindness, giddiness, and critical delirium, appear.

So long as the pupils remained undilated, I have never yet been able to detect any mitigation in the paroxysms. The medium dose is *rad. belladonna* gr. ⅛ twice daily, in the form of a powder. As many children do not readily take powders, it is best to employ a mixture of *ext. belladonna*, gr. ij—iv, dissolved in ℥ss of *bitter-almond water*, of which twenty drops may be given two or three times daily. The reproach of uncertainty of action, supposed to depend upon the manner of preserving belladonna, is even more applicable to the extract than to the powder. In its entire course whooping-cough cannot be cut short by belladonna, and a mitigation of the individual paroxysms can only be accomplished through a poisoning, at the risk of unpleasant consecutive effects.

Opium has been repeatedly recommended. And what was said of belladonna is also applicable to this remedy, only in a still greater measure. When given for some time it produces constipation, difficult to be overcome, and cerebral congestion. Still, at the climax of the disease, when the child has already passed several sleepless nights and is extremely excitable, it is a very valuable remedy. One to five drops of laudanum, according to the age of the child, to be sure, produce several hours of sleep, after which, however, the paroxysms recommence with their former severity.

Some physicians, in addition, extol *ext. conii*, *hyoscyami*, *lactucæ virosæ*, *pulsatillæ*, *nicotianæ* and *aq. amygdal. amar.*, which are rejected by others. In those whooping-cough epidemics which I have so far had an opportunity to witness, I have repeatedly observed that the continued use of narcotics for several days, in the early part of the disease, only caused harm, while, at its climax, a single or repeated narcotism, with opium or belladonna, exercised a favorable influence upon the exhausted and yet excitable children.

The opposers of these narcotics recommend the *metallic antispasmodics*. Their extollers very naïvely say that, with them, a rapid mitigation of the violent cough is less surely effected than a gradual extinction of the convulsive character is achieved, and then only is a cure effected; or, in other words, whooping-cough cannot be hindered much in its regular course by these remedies. Of this class the most preferred remedy is *zinci oxidat.* ℈ss—℈j, pro die; next, *carbonate of iron*, ℈j—℈ij pro die; *acetate of lead*, *nitrate of bismuth*, *sulphate of copper*, and, lastly, *nitrate of silver*.

The most frequently employed *vegetable* and *animal nervines* are *moschus*, *castoreum*, *assafœtida*, *succinate of ammonia*, and lastly *coffee*.

Tonic and astringent remedies are of decided benefit in the last stage of pertussis, and here the powdered cinchona bark is superior to all the rest. In this stage I give to very many feeble children as much of the powder as can be taken upon the point of a common table-knife two or three times daily, without any admixture whatever, and find that they take it without much objection, and for that reason employ it in preference to the decoction, and the altogether too-bitter quinine. Also tannin, by itself, or in equal parts with the flowers of benzoin, given as high as five grains a day, is much praised by some physicians. The equally-bad taste, and especially the constipating effects that invariably result from its repeated employment, are the great objections to it.

Cochineal, a purely empirical remedy, is tolerably extensively used by English practitioners, who, according to perfectly reliable reports, claim to have produced some very remarkable effects by it in some epidemics. On account of its being easily decomposed, it is best to give it in powder mixed with a little sugar, two to six grains pro die. My experiments, performed with it in two epidemics, furnished entirely negative results, and, owing also to the article being somewhat expensive, I have now abandoned it altogether. During the last two years, I have made somewhat extensive use of a remedy that has fallen into much disrepute, namely, calomel. I give it daily to all whooping-cough patients, under one year of age, in doses of one-eighth of a grain for two or three weeks, until the severity of the paroxysms diminishes. Since that time I have observed a far less number of cases of lobular pneumonia, which previously carried off a considerable number of the infants. Consecutive effects, whether immediately or later, do not ensue from this treatment.

The rest of the empirical internal remedies to be mentioned are, *sulphur*, *lobelia inflata*, *viscum quercinum*, *muriatic acid;* and, lastly, *arsenic*, *phosphorus*, and *tr. cantharidis.*

The endermic treatment with *ung. tartar. stibiat.* is now completely abandoned, as cruel and ineffectual. *Lachmann's* method, on the contrary, seems to deserve a further trial. He claims that, in the first stage, whooping-cough may abort by vaccination, and, in already-vaccinated children, strews the powder of a vaccine crust upon a blistered surface, where it is confined for several days by adhesive plaster. It is asserted that blisters treated in this manner cause severe pain, and occasionally even become gangrenous. He also administers the powder internally, a vaccine crust being rubbed up with sugar of milk, and repeats this dose after four days, by which treatment equally rapid cures are claimed to have been achieved.

Lastly, there remains yet to be mentioned, *Watson's* repeated and laborious cauterizations of the mucous membrane of the fauces and larynx with a solution of nitrate of silver, by which it is claimed that the affection is subdued in from eight to ten days. With us, they have not proved themselves of such decided efficiency as to have obtained general recognition.

If now, as a *résumé*, I were to give an explanation of my views, it would go to show that there never has been, and most probably never will be, a remedy by which whooping-cough may be abridged, any more than we are able to cut short the acute exanthemata, or typhus fever, or pneumonia. Hence, an expectant treatment is to be continued as long as possible; the violent paroxysms should be palliated by narcotics; lobular pneumonia in infants we must try to prevent by small doses of calomel; feeble children are to be treated with tonics, and, as a general rule, all the patients should be kept under the most favorable hygienic conditions possible.

(12.) PERIODIC NOCTURNAL COUGH.—Periodic night-cough is an extremely rare and peculiar disease. It is observed in perfectly healthy children, but oftener in those with hereditary tuberculosis, and usually attacks children from two to ten years of age.

Throughout the entire day, the child does not cough, sleeps tranquilly in the evening, and, as a rule, wakes up only after midnight, crying violently, and coughing. Generally, the cough is continuous and dry, not so paroxysmal as to give rise to dyspnœa as in whooping-cough, but severe enough to prevent sleep for two or three hours every night. It is not accompanied by expectoration, and the character of the cough is best compared with that of an hysterical girl, who sometimes suffers from paroxysms of a purely spasmodic cough. This cough recurs every night, not precisely at, but about the same hour, every paroxysm lasting an equally long period, until finally the child, entirely exhausted, and breathing rapidly, falls asleep, to wake no more till morning. Thus it goes on for weeks, and even months, the attacks finally becoming shorter and feebler, and ultimately ceasing entirely. The eruption of a tooth of the first or second dentition often forms the final act of this enigmatical disease. I have met with it but three times; one child, both previously and subsequently to the attack, was perfectly well, but the other two were the progeny of tuberculous parents, and subsequently exhibited very distinctly the signs of progressive tuberculosis. Although the cough in the daytime ceases completely, and no sibilant râles whatever can be heard over the entire thorax, nevertheless, during the whole day, the children are gloomy, morose, and become anæmic. They have not a proper appetite, and mostly suffer from cold feet.

Treatment.—The distinct intermissions which mark the course of the disease seem to indicate a treatment with quinine. But, notwithstanding this circumstance, this remedy has proved itself totally useless, the cough in most instances recurring, even when large doses, from four to six grains, are administered at a time. Small doses of narcotics are quite as unsatisfactory. Opium and morphine, given to produce profound narcotism, do indeed bring about an arrest of the malady for one night, but the attending bad effects of large doses —loss of appetite, headache, and obstinate constipation—are so unpleasant, that I have always been compelled to desist from a continuous administration of these remedies, before obtaining any permanent result. The inefficacy of quinine and morphine proclaims with tolerable emphasis that a material alteration—to be sought for, perhaps, in a swelling or tuberculosis of the bronchial glands—must be at the bottom of this disease. It is best to limit the treatment to a good diet and tonics, fresh air, and uniform temperature, with which, according to the experience so far acquired, the malady has always, although after a very long time, terminated favorably.

F.—*PLEURA.*

(1.) PLEURISY (*Pleuritis*).—Pleurisy may even attack children *in utero*, who then as a rule perish, or survive the delivery but a short time. In the new-born child, phlebitis umbilicalis is a frequent cause of purulent absorption, and thus also of secondary pleurisy.

Empyema occurs so rarely in early infancy that the most experienced Pædiatricars have only been able to report a few solitary instances. On the other hand, general pleuritic adhesions are often found in young children, who, during life, suffered from pulmonary affections, particularly from phthisis pulmonalis. In older children empyema occurs not infrequently, becomes, when no complications are present, tolerably quickly absorbed, and leaves behind it no remarkable deformity of the thorax. Altogether, pleurisy in the first age of childhood may be regarded as an extraordinarily rare affection, and as a tolerably infrequent one after the beginning of the second dentition.

Pathological Anatomy.—According to *F. Weber*, of Kiel, to whom we are indebted for most of our knowledge concerning this condition, the profuse transudation of bloody serum into the large serous sacs, and consequently also into the pleural cavities, is to be accurately distinguished from the genuine pleurisy of still-born children. No flakes of fibrin are ever found in that simple cadaveric transudation, nor has the mother during her pregnancy experienced any symptoms referable to that condition. In these still-born children, *Weber* assumes a *purely inflammatory* and a *dyscrasic pleuritis.*

In *purely inflammatory pleurisy* of children before birth, the corresponding lung, in most instances, is also affected. The pleurisy is unilateral or bilateral, and is seen as a thick or thin, fibrinous, whitish, transparent layer, which sometimes is easily, and other times again with difficulty, pulled off. The serous effusion is here always insignificant, yellow, and clear, and entirely different from the cachectic, never putrid, and never very strongly tinged with blood.

In *dyscrasic pleurisy*, both pleural sacs, and, in addition, generally also the pericardium and peritonæum, are simultaneously affected. The exudations are present in larger quantities than in the preceding form, and have a dirty, opaque appearance, and a putrid smell. This form occurs only in lying-in-hospitals, and at the climax of epidemics of puerperal fever. Pyæmic pleuritis, occurring as a result of umbilical phlebitis, also has the same characters.

In older children, pleuritic adhesions and layers of false membrane are very frequently observed; very seldom, however, large effusions. These inflammatory affections of the pleura but very rarely occur primarily and in an isolated form, but are always complicated with disease of the lungs and with tuberculosis. The morbid formation of false membranes, the displacement of the thoracic viscera, and of the diaphragm, are similar to those which take place in the adult.

Symptoms.—Every pleuritis begins with *fever*. The child becomes restless, sleepless, loses its appetite, and suffers thirst. The most distinct sign of fever is always an increase in the temperature of the skin over the entire body; whereas the frequency of the pulse, particularly in infants, deserves less consideration on account of its great physiological fluctuations. Older children suffer also from a chill.

In young children the *pain* can only be elicited by exercising an alternate pressure upon various parts of the thorax, or by percussion. Pressure or a blow upon a part freshly attacked by pleurisy always causes the child to utter a cry or moan of pain. Somewhat older children, two or three years of age, when questioned concerning the site of the pain, point to the præcordia, though there be no signs of disease there. To the statement of children under five or six years old, as to the locality of pain, no value can be attached. Generally, it comes on simultaneously with the fever, but hardly ever is of long duration, exhibits very distinct remissions, and, after four to six days, often disappears entirely, even without any remedies having been employed.

In general, it may certainly be said that the fever and the pain progress pretty regularly together, still, very frequent exceptions occur to this rule. The sudden recurrence of a pain that has been absent for several days deserves particular consideration, especially if it is attended by fever; for it then indicates that the pleuritis is not simple, but a complicated one, and pulmonary tuberculosis may be stated to be the most frequent complication of, or rather cause for the appearance of such symptoms. The pain also exercises great influence upon the degree of the dyspnœa, which at first is much more aggravated by it than by the mechanical impediment, the effusion. As soon as the dulness becomes considerable, the effusion consequently having become greater, the pain, in most instances, vanishes altogether, and in its place the mechanical embarrassment, produced by the compression of the lungs, ensues. Why the pain is often confined to one spot only, notwithstanding the great extent of the pleurisy, is difficult to explain. The most plausible supposition, it seems to me, is, that the inflammation, in some part, implicates the neurilemma of the intercostal nerves, and thus the circumscribed, fixed pain, violently aggravated on pressure, is produced.

The *decubitus* in young children, who, in general, lie on the back, naturally has no great significance; but older children, at the invasion of the pleurisy, as a rule, lie, as long as the pain exists, upon one side, but not always upon the one corresponding to the pain. This seems to depend upon whether the pain is aggravated more by the pressure, or by the acts of respiration. In the first case, they lie upon the sound side; in the second, upon the affected one; for, in this later decubitus, the acts of respiration become smaller in a purely mechanical manner, without any special effort on the part of the patient.

The acts of respiration vary in *kind* and *number* according to the pain and fever. The more intense these two symptoms are, the more rapid and superficially do the children breathe. On the other hand, the effusion, after the acute process has ceased, is seldom so bulky as to keep up a continuous acceleration of the respiration. In form, the accelerated breathing is that of the expiratory, i. e., the accent lies upon the expiratory sound. No actual dyspnœa is present, but the respirations are frequent and superficial, in order that the deeper and painful ones may be avoided. For the same reason the movements of the alæ nasi are also less marked than in parenchymatous disease of the lungs, for example, in pneumonia, or advanced tuberculosis.

By inspection it is not possible to ascertain upon which side the pleurisy is situated, so long as there is only a pleuritic membranous exudation, and no bulky liquid effusion. But, when the latter has formed, the intercostal spaces become obliterated and bulge outward, and all those ribs which are separated from the corresponding part of the lung by the fluid effusion *remain stationary*. Then, mensuration of both thoracic halves also furnishes a larger circumference for the affected side. In lean children, a sinking of the liver, in right unilateral effusions, is seen, and, in left unilateral effusions, a displacement of the heart toward the xyphoid cartilage, and even beyond it.

Pleuritic effusions may very readily and accurately be diagnosticated by *palpation* of the vocal fremitus, and, in children, this method of examination is of the greatest value, as it can be practised in restless, crying children. So far as the fluid exudation reaches, no, or but a feeble, fremitus of the voice is to be felt, while it is felt at the same time stronger over the rest of the thorax. Friction-sounds are extremely rarely met with in children at the beginning of pleurisy. They are somewhat more frequently heard in an empyema undergoing absorption, and are generally found at the place of transition from dull percussion to sonorous sound. Indeed, it is even possible to detect them by palpation alone, but, by palpation, it is very easy for one to be deceived by simultaneously-occurring sibilant râles. In quiet, sensible children, this physical method of examination may readily be completed by auscultation. At the commencement of a pleurisy, either friction-sound or normal vesicular breathing is heard, provided the lungs have not been previously affected. In most cases nothing whatever is to be heard after the fluid effusion has separated the lung from the ribs; sometimes, however, very unexpectedly, and without our having been able until then to obtain a special explanation, well-marked bronchial respiration is heard, but which lasts only for a few days, and then totally disappears. But when the exudation becomes so large in quantity that the lung of the affected side is wholly compressed and pushed backward into a solid compact mass, not puerile, but bronchial breathing will be heard upon the dorsum of the thorax as far as the airless lung extends. As the absorption of the empyema progresses, the lung dilates, the bronchial breathing disappears, sibilant râles often come on, or the normal vesicular breathing is again heard.

Percussion supplies positive results in very extensive fluid effusions only; compact pleuritic exudations, and, still less, simple pleuritic adhesions, effect no alteration whatever in the percussion-sound. But, when pleuritic effusions have actually taken place, we have a far more distinct dulness than in solidification of the pulmonary tissue; we get a completely flat sound (the so-called thigh or wall sound).

On the margin of the dulness, a tympanitic sound is invariably heard, which extends itself for some distance into the sonorous sound.

If at any time a large quantity of purulent effusion had accumulated in one of the pleural sacs, and subsequently become absorbed, a condition that is almost exclusively met with in children several years old appears. The behavior of the pleura after the absorption of the empyemic fluid, so strikingly observed in adults, soon becomes manifest. *On the affected side* the shoulder is depressed, the nates somewhat elevated, the entire pectoral half flattened and contracted, strongest between the fifth and eighth ribs, and the spinal column suffers a lateral curving, the concavity of which is directed toward the affected, the convexity toward the healthy side. A compensatory curvature of the lumbar vertebræ is, of course, also present. As the patients progress in recovery, and become invigorated, these distortions disappear almost completely in a few years, which is very much facilitated by an appropriate gymnastic training.

Spontaneous perforation of the thoracic walls, and evacuation of its contents outwardly, occur oftener in empyema of children than in that of adults. An erysipelatous erythema, attended by fever and lancinating pains, appears on some part of the thorax, most frequently on its anterior part, under the nipple; the corresponding intercostal space bulges more and more, fluctuation at length becomes more distinct, and, finally, there forms a circumscribed oval swelling, which bursts spontaneously, or may be opened with a lancet without any danger. At first a large quantity of pus is evacuated, but soon the abscess contracts, and is converted into an oblique, angular, fistulous passage, which frequently closes, but after a while is again attacked by inflammation, and breaks open anew. Such a fistulous canal will remain open for months, and even years, according to the condition and distensibility of the corresponding lung, and ultimately closes with a radiating, contracted, deep-pitted cicatrix. Caries of the ribs, notwithstanding the long duration of the process, scarcely ever occurs.

The *complications* of pleuritis are numerous. First of all, the various general diseases, in the course of which pleurisy may become developed, are to be mentioned. Thus, it occurs in scarlatina, measles, small-pox, typhus fever, pyæmia, and scorbutus. The frequency of these complications varies according to particular epidemics. Pleurisy is most unfavorable and dangerous when it supervenes early on a general disease, while that occurring during convalescence comparatively often takes a favorable course. Pleurisy, as a result of pyæmia and scorbutus, is, naturally and unexceptionally, fatal.

Pleuritis very often is a secondary disease of tuberculosis and pneumonia. In fact, there is no peripheral morbid alteration of the pulmonary parenchyma in which the pleura does not participate. Although the ordinary form is that of simple adhesions, or, at the most, of narrow pleuritic membranes, still, quite extensive effusions not infrequently occur, especially in tuberculous children. They are scarcely ever simply purulent, but metamorphose even into the tuberculous. The entire pleura, surrounding the exudation, is converted into a yellow, granular, tuberculous membrane, and no absorption of any such exudation has yet been observed. Perforation of a tubercular lung into the pleural cavity and pyo-pneumothorax, as a result of the more acute course of tubercles in children, rarely occurs.

The course and termination are variable. Acute primary pleurisy, as it sometimes attacks healthy older children, is, notwithstanding the extensive effusion filling up the entire pleural sacs up to the apices of the lungs, not a dangerous disease. After one or two months, absorption begins, and, if the children are in other respects healthy, is completed in three months. Even the *habitus* of the absorbed empyema that remains behind is tolerably well outgrown in the course of a few years. Acute *secondary* pleurisy, as it is observed in the course of acute exanthemata, of typhus fever, and of tuberculosis, is incomparably more dangerous, and pyæmic pleuritis of the new-born child is unexceptionally fatal. So also is pyo-pneumothorax, after the bursting of a tuberculous cavity; but this, on the whole, is a very rare condition.

Chronic pleuritidis, thin layers of false membranes or simple adhesions, such as accompany every affection of the lungs, are apt to undergo no or extremely slow absorption. The morbid alteration of the lungs becomes so prominent here, that the pleuritic phenomena very seldom attract any attention. Sacculated empyemas, which in the adult may exist for ten and twenty years, do not occur in children, in whom the more rapid development is always attended by a comparatively quicker absorption.

Treatment.—Many words need not be wasted in describing the therapeutics of secondary pyæmic pleurisy of the new-born child, for it is a fatal affection under all circumstances. Primary pleurisy of older children, with rapid effusion at first, is to be treated moderately antiphlogistically. There is no remedy by which the augmentation of the effusion can be certainly arrested; it is not possible to accomplish this even by the largest abstractions of blood. This remedy, consequently, is not admissible; still, it cannot be denied that in older children, over five years of age, the severity of a pleuritic pain may be very much alleviated by a few leeches. In infants, the moist girdle alone, already described in the section on pneumonia, but which has to encircle the whole thorax for from four to six days, suffices to mitigate the pain.

The internal treatment, so long as the fever and pain are very considerable, is best founded upon the administration of small doses of calomel, to which small quantities of opium may very properly be added—¼ to ½ grain of calomel, and 1/10 to 1/6 grain of opium, may be given daily to children, three to six years old. Diarrhœa should never be allowed to run very long. If the pleuritic effusion has already ceased to increase, and has become stationary, the fever will subside too, and then there is no indication for the above-named remedies. The question that comes up for consideration is about the removal of the effusion in as short a time as possible. For this purpose inunctions of blue and iodine ointments are resorted to. Internally the various diuretics are recommended.

The alkaline diuretics, nitrate and acetate of potassa, are not adapted to children, on account of their bad taste and drastic effects. On the other hand, small doses of digitalis, gtt. vj—xij pro die of the tincture, in a two or three ounce vehicle, are very well borne, but are to be discontinued as soon as slowness of the pulse ensues, and repeated when that passes off. But *roob** *juniperi* is tolerated longest and best of all the diuretics, of which one or two teaspoonfuls daily may be given to the child for months. The effects of the diuretics, on the whole, should not be over-estimated, for it has often already been observed that such simple pleuritic effusions, under favorable circumstances, have in a few weeks disappeared entirely, although no internal treatment had been resorted to. Proper nutrition and good air are the main factors for the success of a rapid absorption. Hospital air acts extremely injuriously upon the absorption of an empyema, and such patients are therefore to be kept as far from the hospitals as possible. In older children the operation of paracentesis thoracis has often been performed with success. I, however, have never yet met with a case where it was absolutely called for, and for that reason have never performed it.

Twice I saw, in healthy, robust, well-developed children, a swelling arising under the mamma, one of which opened spontaneously, the other was opened with the lancet. In both instances a large quantity of pus escaped at first, and the lungs dilated correspondingly. But the fistula which remained healed only after the lapse of years, and several times broke out anew.

(2.) HYDROTHORAX.—In nurslings, serous effusions into the pleural sacs occur very infrequently; in older children, however, they are more frequently seen as the effects of certain diseased conditions. The fluid poured out is purely serous, yellow, albuminous, and the salts it contains exhibit the same quantitative proportions as those of the serum of the blood. On the pleura itself no morbid alterations are to be detected, if no pulmonary disease with mild pleuritis have preceded it.

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* See note on page 223.

Etiology.—Some authors still assume that a primary, essential hydrothorax may occur, but that is extremely problematical, for some preceding diseases, in certain instances, are readily overlooked. Nephritis, the result of scarlatina, undoubtedly furnishes the most frequent cause; next follows the intermittent-fever cachexia, and finally, as the rarest cause, an acquired disease of the heart is to be mentioned. The rest of the cachexiæ, through which, in the adult, hydrothorax may also be engendered, such as hepatic cirrhosis, chronic Bright's disease, carcinoma, paralysis, etc., scarcely ever occur in children.

Symptoms.—Hydrothorax after scarlatina appears several days after anasarca has appeared, but by this we do not intend to say that it must absolutely follow in this manner. Anasarca is regularly ushered in by febrile phenomena, which become aggravated when serous effusions into the pleural and peritoneal cavities are superadded. The formation of the diagnosis in that case is much facilitated by the existence of the anasarca.

Hydrothorax, as a result of intermittent-fever cachexia, sometimes occurs with, sometimes without, fever. Generally, however, anasarca is also present here, at least of the lower extremities. The grayish-yellow color of the face, the extreme anæmia of the mucous membranes, and the invariably present splenic enlargement, are such prominent signs as to preclude the possibility of mistaking the intermittent cachexia for any other.

Hydrothorax in consequence of disease of the heart is the rarest form, because in children endocarditis occurs very infrequently, and generally quickly terminates fatally, and because congenital cardiac malformations terminate usually too early to produce dropsical effusions.

Hydrothorax, in contradistinction to pleurisy, is much oftener observed on both sides than on one side only; still, the quantity of the effusion is seldom alike on both sides. The pain in the side, so constant and persistent in pleurisy, is totally absent in hydrothorax. In a marked example of hydrothorax, the dulness is complete, and its boundaries may be changed readily by varying the position. Children, however, do not willingly submit to this kind of manipulation. The fluid is so thin and copious, that it quickly changes its place in accordance with the laws of gravity. Friction-sounds are never felt nor heard, but the external form of the thorax becomes altered as strikingly as, and perhaps still more so than, in empyema. Dilatation and bulging of the intercostal spaces, immobility of the part of the thorax with which the serum is in contact, and alterations of the position of the heart and liver, occur here in the most striking manner.

As hydrothorax in most instances is bilateral, the dyspnoea, therefore, increases rapidly; soon orthopnœa, cyanosis, and œdema of the lungs supervene, whereupon death quickly ensues. The secretion of urine in most instances is very much diminished; the bowels may be torpid, or, as is frequently the case, a derivative attempt may have been made by the alimentary canal, giving rise to diarrhœa.

The pulse at first is much accelerated, but in moderate dyspnœa may soon return to its normal condition.

The *prognosis* may be set down as most unfavorable after scarlatina, not very favorable after intermittent fever, and decidedly unfavorable, if not positively hopeless, after cardiac disease.

Treatment.—A debilitating, antiphlogistic treatment is never indicated here, although in the first days of the illness distinct febrile phenomena may have been present. The subjects always become so exhausted by their preceding sufferings, that it seems absolutely necessary to pay the utmost attention to the nutrition. Nourishing broths, with yolk of egg and milk, should therefore be allowed them, and as much as they will consume; and an attempt is to be made by mild diuretics, such as will not disturb the digestion nor cause diarrhœa, to stimulate the kidneys and to promote the excretion of the urine. In this respect a few drops of the tincture of digitalis, with *roob juniperi* in large doses, as I have often stated, are the most appropriate remedies. In the after-treatment, quinine and iron are most to be relied on.

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CHAPTER V.

DISEASES OF THE NERVOUS SYSTEM.

A.—*BRAIN.*

(1.) Hydrocephalus Acutus Internus. *Synonyma.*—Meningeal tuberculosis, morbus cerebralis Whyttii, hydrophlogosis ventriculorum cerebri (*Lobstein*), febris hydrocephalica. Entero-cephalopyra (*Eisenmann*).

The pathology of hydrocephalus consists in a miliary tuberculosis of the arachnoid membrane, especially at the base of the brain—in an intense augmentation of the normal fluid contents of the cerebral ventricles, and in a softening of the parts of the brain entering into the formation of the cerebral cavities. Tuberculosis of the meninges is generally stated to be the exciting cause, and an acute internal hydrocephalus, not tubercular, is also spoken of. I have never yet met with this latter kind of acute dropsy of the head; but of the former, on the contrary, I have dissected more than fifty cases, and the majority of them I also observed during life.

Pathological Anatomy.—In these autopsies, the dissection of the skull must be performed with the utmost caution. If the large fontanel is not yet closed, it will be seen to bulge out enormously, and often a decided fluctuation may be detected over it. The skull should be sawn very slowly, and the movements of the saw should be short, especially toward the close of the operation, in order that the brain, which is often very soft, may not be injured, and the contents of the ventricles be lost before they are closely inspected. If the dura mater, at certain places still adheres to the bone, it will be very difficult to remove the calvarium, conjointly with the dense dura mater, without injuring the brain. In these rare cases it is advisable, after the skull has been sawn through, not alone to sever the dura mater all around, but also the brain, and then to remove the calvarium, dura mater, and the whole portion of the cerebral substance lying above the incision, *en masse*, by the aid of a brain-knife or spatula. It is true that, by so doing, the ventricle is opened and its watery contents escape, but then we have the advantage of being able to examine more accurately the base of the brain, and we thereby also spare the rest of the generally soft, friable portion of the organ.

After the calvarium and dura mater have been removed, the brain to a certain extent bulges out over the edges of the divided skull, the pia mater and arachnoid will be found to be very tense, the arachnoid membrane upon the convex part of the brain dry, and the convolutions obliterated; it is, therefore, plain that the cerebral substance has been firmly compressed from within outward against the bones of the head. That the injection of the meninges in the cadaver had no connection with the injection of the meninges during life now becomes sufficiently evident, and there is nothing peculiar in the circumstance that in acute hydrocephalus they are sometimes found dark red, and then again very pale and anæmic. If it is desired to institute a chemical examination of the hydrocephalic fluid, which is very instructive, the ventricle should be punctured very cautiously with a trocar and only the fluid thus evacuated should be examined; for, if the whole quantity of liquid that escapes on opening the ventricle be collected, it will always be found to be a mixture of blood and cerebral dropsical effusion, which is entirely unfit for the purpose of such a chemical examination.

The chemical analysis of a pure hydrocephalic effusion furnishes extremely peculiar results, to which *C. Schmidt* first directed the attention of the profession. The chemical reaction of this fluid is always distinctly alkaline; it is almost as clear as water, and contains only *traces* of albumen, for, on boiling it and testing it with acid, it is rendered hardly perceptibly turbid, and precipitates no large dense flakes of albumen. The proportion of salts in the effusion is also a peculiarity that deserves to be mentioned. While the transudation collected from the peripheral meninges, pia mater, and arachnoid, contains the salts exactly in the same proportions as the exhalations from other serous membranes—to wit, in the proportions of the serum of the blood—the transudation of the choroid plexus contains more combinations of potassium and of phosphorus, so that the proportion of potassa to soda and that of the phosphates to the chlorides, approximates nearer the salts as they occur in the blood-corpuscles. While the salts of the meningeal transudation, according to *C. Schmidt*, contain 2.8 per cent. of potassa and 40 per cent. of soda, in the salts of the fluid from hydrocephalus internus nearly 17.8 per cent. of potassa and only 27.2 per cent. of soda are found. We have therefore in this case no mere filtration of the serum of the blood, but a peculiar secretion, in the formation of which the salts of the corpuscles of the blood seem to participate.

The walls of the ventricles are more or less softened, and their ependyma (lining membrane) is destroyed. The distention of the lateral ventricles is often of such an extent as to rupture the septum ventriculorum, and the two cavities then directly communicate with each other. In extreme cases this softening is also found in the optic thalami, in the corpus callosum, and in the corpus striatum, the upper surface of which appears eroded, shreddy, flocculent, and uneven. The choroid plexus is bloodless, very pale, and *not* superabundantly filled with blood, as is unaccountably stated in most of the late French works. This bloodlessness is very natural, for the enormously accumulated fluid must very greatly impede the filling of this arterial plexus. The anæmia, in connection with the general dilatation of the ventricles, is the best criterion by which to judge of the extent of the hydrocephalus, if accidentally or incautiously the liquid, on opening the skull, has been allowed to escape prematurely.

This part of the examination having been concluded, we then turn our attention to the base of the brain. Here a whitish or greenish-yellow exudation of a peculiar gelatinous nature is seen to have been deposited in and between the pia mater and the arachnoid membrane.

By this exudation the sulci of the brain have become agglutinated and plastered over, and the depressions at the base of the brain, especially those corresponding to the cella turcica, are evenly filled out and obliterated. The exudation is most abundantly accumulated within the bilateral hilus cerebri, from the chiasma opticum to the pons, over this on to the medulla oblongata, and spreads upward, especially into the fossa Sylvii, and the longitudinal fissure of the cerebrum. Here, in the fossa Sylvii, along the artery and vein, the tuberculous character of this exudation is most distinctly recognized, for here, in particular, a countless number of fine white granules is seen, which, on microscopic examination, prove to be miliary tubercles. They consist entirely of an amorphous granular mass of detritus; the fibres of connective tissue seen here and there do not belong to the miliary tubercles, but to the pia mater, in which the tubercles are embedded. Miliary tubercles, in addition to being found in the fossa Sylvii, are also seen to have been deposited over nearly the entire base of the brain, especially along the course of the vessels.

In regard to the other organs, it is always observed in this affection that an older, larger, yellow tubercle exists somewhere in the body, most frequently, in fact, in the bronchial glands; next in the lungs, then in the brain itself, and sometimes also in a bone. The connection between acute hydrocephalus and softening of the stomach, mentioned in some text-books, in reality does not exist, as has already been clearly shown in our remarks on softening of the stomach, page 149.

Symptoms.—The disease most frequently attacks children from two to seven years of age. The youngest child in whom meningeal tuberculosis has been observed was three months old; in older children and adults the miliary tuberculosis localizes itself much oftener in the lungs than in the meninges.

Many divisions into stages have been proposed with a view of facilitating the study of this disease. Thus (1) a stage of congestion; (2) of inflammation; and (3) of exudation, have been assumed. *Bouchut* speaks of a stadium prodromorum, invasionis, and convulsionis, but, strictly speaking, no stadial division, based upon pathological anatomy, can be assumed; symptomatically, one into (1) a stage of irritation and (2) of paralysis may be practicable. In the first stage, the prodromata and the symptoms of hydrocephalus that have already appeared may be recognized.

The prodromata are of an extremely peculiar and variable form. Although it certainly cannot be denied that the study of these has been extended somewhat too far, and that much that is irrelevant has been added to them, still their existence cannot be ignored. Above all, it is necessary to determine whether the acute hydrocephalus has developed itself in a child, who, for a long time previously, has had distinct signs of tuberculosis—usually pulmonary—or whether these signs have hitherto been absent, and the disease has developed itself in an apparently perfectly healthy child. It is, indeed, asserted by some hospital physicians that the premonitory signs may be totally absent, and the symptoms of developed inflammatory hydrocephalus may come on at once; in private practice, however, such cases have not been observed. Here, for several days, sometimes even for many weeks, some tolerably constant prodromata are always noticed, which only slowly become aggravated, till we finally have the disease before us developed in its most dangerous form.

This stadium prodromorum usually lasts two or three weeks, though cases are also met with where the children present these signs for several months. The most constant of these symptoms is a slowly progressive emaciation, which, in a most remarkable manner, entirely spares the face, so that the child, when dressed, presents nothing unusual in its appearance. But observing mothers and nurses invariably notice it, and the prominence of the ribs, in particular, excites their apprehension. A slight pallor of the countenance, and a peculiar lustre of the eyes, soon become associated with this condition. The patient now loses all healthy cheerfulness and liveliness habitual to it. It sleeps more than usual, soon forsakes its amusements, becomes morose and timid before others, and cries for the slightest cause. It is also very remarkable that it does not attempt any of its former little braveries, for instance, the climbing upon chairs, the opening of difficult door-latches. Even the looking out of a grated window intimidates it, and, when requested to perform these feats, it will sternly refuse. Boys who formerly would put up with nothing from their comrades, but were always ready to fight and defend themselves, now cowardly slink away crying. Other children, again, become remarkably affectionate, constantly embracing and clinging to their parents, and, when left alone, are inconsolable.

In older children, who have already commenced study, the tutor notices an unusual absent-mindedness and indifference; the learning by heart is more difficult than before, and what is finally acquired is uttered in a stuttering manner. The children sleep very much, and often fall asleep in the daytime. Their night-sleep, however, is not sound, is repeatedly broken by unpleasant dreams; they toss about in bed, and frequently break out into apprehensive exclamations. The appetite is gone; often there are capricious longings for stimulating food, of which, however, but little is consumed. The thirst is not augmented, the secretion of urine but slightly diminished;

the urine is often so rich in urates that they settle on the bottom of the vessel, and form what has been called the brick-dust sediment. The bowels are usually torpid, particularly in older children; but, should a diarrhœa exist, it should not, by any means, be interpreted as incompatible with the existence of acute hydrocephalus. Particularly in infants, who are still laboring under the first dentition, it often happens that the ordinary diarrhœa of dentition continues as in the normal state, and an acute hydrocephalus has nevertheless been intrenching itself. Headache is scarcely ever complained of, even by older children; vertigo and an unsteadiness on walking are much oftener observed. Some time ago, a boy four years old, who displayed several premonitory symptoms of acute hydrocephalus, was brought to me. On walking upon the even floor, he always lifted up his feet very high, as if mounting a step. In the course of a few days the disease developed itself more markedly, and the autopsy subsequently confirmed the diagnosis. These children tolerably often complain of abdominal pains, which are distinctly aggravated on pressure. Fever is usually not present; still, what has been said of diarrhœa is also applicable to this symptom, the presence of fever is no reason whatever for excluding the possibility of a commencing hydrocephalus.

The symptoms just described, conjointly or singly, now become more and more aggravated; the children betake themselves to bed, and hereupon the signs of commencing effusion, likewise those of cerebral irritation, develop themselves.

Different are the circumstances when children with marked pulmonary tuberculosis in addition acquire meningeal tuberculosis and hydrocephalus. In this case, the symptoms of the preëxisting phthisis pulmonalis, such as hectic fever, excessive weakness, severe bronchitis, etc., are naturally so conspicuous that the prodromata, delineated above, are scarcely noticeable. Then, the disease begins directly with the symptoms of commencing effusion, and the irritation produced by that process.

The most characteristic symptoms of the *stage of irritation* are: vomiting, constipation, slow pulse, unrhythmical respiration, increased temperature of the skin, retracted abdomen, headache, extreme excitability alternating with somnolence, diminution of the intelligence, and the various kinds of motor disturbances.

The preponderating symptoms of the *stage of paralysis* are: great acceleration of the pulse, profound coma, and paralysis of the voluntary muscles. In order not to break off constantly in the description of the individual symptoms, and as the transition of one stage into the other can by no means be so accurately defined, as some of the text-books declare, this stadial division will, therefore, be dispensed with in the following delineation, and each symptom will be followed at once to its fatal end.

As regards the disturbances of the digestion, *vomiting* must rank first. It is a remarkably constant symptom, and usually comes on so early in the disease that the diagnosis may be established by it much earlier, and with greater precision than by any other symptom. The duration of the vomiting, however, is very variable. Some children vomit for only one day, others several days, and only a part of the food partaken of. Others, on the contrary, vomit incessantly from the commencement of the disease almost till death, and there is no article of food which is not vomited almost as soon as it is taken. A peculiar feature about this vomiting is, that it makes no remission, never recurring, after it has once ceased for twenty-four hours. The manner in which the children vomit is of the utmost importance in the formation of the diagnosis. While children who suffer from an indigestion are afflicted, for a long time before the actual vomiting, with nausea, eructations, retchings, and cold sweats, hydrocephalic children vomit without any such preparations, just as if they had taken a mouthful of water and then simply spat it out again. The act of vomiting is facilitated by setting the children upright, or by laying them on the side. It is arrested so long as the stomach remains entirely empty; when liquids, and, still more so, compact nutriments are introduced, they are instantly ejected without any apparent distress or difficulty. Very seldom is the matter vomited mixed with bile, a circumstance that is readily explained by the slight antiperistaltic action of the stomach. As the physician seldom personally witnesses the act of vomiting, and, consequently, has to rely entirely upon a verbal description of it, he should accurately question the relatives, and make them understand that they are carefully and minutely to observe the manner of vomiting—whether it is easy or difficult, with or without retching.

A second almost equally as constant a symptom is *constipation*, from which at least three-fourths of all the hydrocephalic children suffer. The intestinal secretions are so diminished that even the more powerful drastic cathartics have no effect, even when they are not vomited, which very often occurs. Calomel, so much in vogue in other forms of constipation in children, is almost entirely inert in this one. This constipation does not continue till death; latterly, thin colliquative stools are voided, no matter whether aperients have been employed or not. Even profuse diarrhœas, the effects of intestinal tuberculosis, may cease in commencing hydrocephalus, but the stools which subsequently follow are again thin, and have the well-known putrid odor. As a rule, constipation is less constantly observed than vomiting, for instances not very infrequently occur in which regular stools take place daily from the invasion till the end of the disease. The material diminution of their quantity is very natural, and is to be explained by the diminished consumption of nutriments. The appetite is gone, and the food that is laboriously administered is vomited, and it is, therefore, very easy to comprehend how a constipation of several days' duration may occur, and in which the abdomen nevertheless becomes more and more retracted, and no fecal matter passes through the intestinal canal.

The rest of the alterations of the digestive apparatus are less pathognomonic. The thirst never becomes so intense as in other acute febrile conditions, for example, typhus fever, or the acute exanthemata, and the secretion of urine is correspondingly always very much diminished. This absence of thirst is, in fact, a natural result of the slightly-increased temperature of the skin, and the inconsiderable acceleration of the pulse, and of the disturbed innervation of the stomach. The urine is very concentrated, rich in urates, uric acid, coloring matter, and salts, and therefore deposits in the bladder, or immediately after it is voided, a thick sediment. Toward the end of the disease, the child often passes no water for twenty-four hours, or even more, and yet the bladder does not become distended, showing the existence of a paralysis of the nerves governing this secretion. The urine that is finally discharged, or drawn off by the catheter, is turbid, has a pungent odor, and an ammoniacal reaction. Albumen, so far as I am aware, is not found in it.

The *appetite* is seldom as completely absent as in the diseases just alluded to; though it is true that there is no desire for food, still it is almost always possible, without any great difficulty, to administer milk or beef-broth to such patients, and this is all the more surprising, as vomiting almost invariably follows.

In this stadium, the tongue is always moist, more or less coated with a white fur, and furnishes nothing characteristic. The tongue remains moist in almost all infantile diseases, which is due to the circumstances that the mucous secretion of the mouth is very profuse at this age, and that children have the good habit of sleeping with the mouth shut. The gums are likewise always moist, but on these, too, the white fur that appears in most of the diseases is also seen.

The febrile phenomena in hydrocephalus are never of high grade. In miliary tuberculosis, which develops itself entirely in the pia mater, fever can hardly be said to ever occur; but if, on the contrary, the miliary tuberculosis involves other organs also, especially the lungs, or the peritonæum and pericardium, as pungent a heat of the skin appears as is commonly met with at the eruption of an acute exanthema. The temperature of the head, particularly the forehead, is, in all instances, decidedly elevated, and remains so to the end, while the feet are very prone to become cold.

In general, the temperature of the skin stands in exact relation to the rapidity of the pulse, but the forehead always remains hot, even when the pulse becomes ever so slow.

The condition of the *pulse* has always been regarded as of great importance in acute hydrocephalus, and there is, in fact, no disease in which it deserves so much attention as in the one under consideration. In the incipiency of the malady, the frequency of the pulse is due more to the miliary tuberculosis that has developed itself in the other organs than to that of the meninges. When the miliary tuberculosis is very extensive, and in course of development in the rest of the organs, the consequent acceleration of the pulse will counteract the retardation actually caused by the cerebral affection, and may continue for many days, till finally the slow hydrocephalic pulse comes on. If, on the contrary, the meningeal tuberculosis occurs, the retarded pulse soon manifests itself, and is readily recognized by the lessened frequency and modified quality of its beats. Whatever may be the explanation, it is a fact that the pulse, at the commencement of acute hydrocephalus, is often accelerated, but that in other cases it also becomes slower and slower from the first day of the disease on. In the majority of cases, it is at first slightly accelerated, and becomes retarded in a few days. As the watery effusion in the cerebral cavities becomes augmented, the number of the beats sinks down to between forty and sixty; usually, however, the pulse does not remain stationary upon any definite number, but changes from hour to hour, so that, in the course of twenty-four hours, it may be forty, then sixty, and then, again, eighty per minute. These varying conditions of the pulse are differently explained by different clinical observers. Whatever view they take, I have often convinced myself of the correctness of the fact. In most cases qualitative changes of the pulse also occur, a strong throb follows several small ones, or *vice versa;* also distinct but not regularly-recurring intermissions take place, and sometimes the pulse assumes a peculiar vibrating character, imparting to the finger a sensation as if it rested upon a vibrating string. This character disappears as soon as the finger presses a little more firmly upon the artery, and an easy, cautious touch is, therefore, necessary for this examination.

One to three days before death, the pulse again becomes rapid, and indeed so rapid that it is hardly possible to count it. It may reach 180 to 200 in the minute. When this continually-augmenting frequency of the pulse supervenes upon the above-described retardation, with its accompanying alteration of quality, a speedy end may be prognosticated with the utmost certainty, for this great acceleration is to be interpreted as indicating commencing paralysis of the pneumogastric nerve.

The alterations of the *respiration* are also of great importance. At the invasion of the disease, the breathing goes on normally, except in those cases where the miliary tuberculosis in the lungs has made great progress, and the fever is intense. Then, of course, the respiration is very much accelerated, and this acceleration is due as much to the local disturbances as to the fever, with its implication and depression of the organism. But as soon as the symptoms of exudation have become more prominent, then they are also infallibly manifest by the respiration. It, for example, becomes much slower and completely unrhythmical. In one minute the child respires fifteen times, in the next thirty, and in another twenty. At one time the respirations are superficial, and occur with a barely perceptible dilatation of the thorax, and without any audible sound; then, again, they are deep and sighing. This latter kind of respiration is so constantly observed, that these have been called hydrocephalic sighs. This retarded and unrhythmical respiration takes place in all cases, even in those where advanced pulmonary tuberculosis gives rise to marked acceleration of the acts of respiration. Occasionally the breathing is arrested for ten seconds and more; and the next gasp, that is waited for by the parents with anxiety, occurs as a deep, long sigh; and, immediately upon that, several very normal, tranquil inspirations follow. If the pulse, shortly before death, has assumed that extraordinary rapidity already described, the respiration also will become more rapid again—about as rapid, but not as rhythmical, as in the normal condition, and by no means in exact proportion to the extreme frequency of the pulse.

The physical examination of the lungs furnishes either entirely negative results, or in some cases it reveals the presence of pulmonary tuberculosis with cavities, which, in childhood, very remarkably, are much more often met with in the lower lobes than at the apices of the lungs. For a long time I have been in the habit of repeatedly and attentively percussing the sternum in all hydrocephalic children, on the supposition that the ordinary bronchial glands, swollen into large masses, would produce an especial dulness in that region. This examination, however, has proved to be entirely fruitless, for the bronchial glands, even when they are ever so much enlarged, are never enlarged anteriorly toward the sternum, but always laterally into the lungs, downward beneath the bifurcation of the trachea, and backward toward the spinal column. Hence the reason why no extensive dulness is ever observed over the sternum, although, at the autopsy, the tuberculous bronchial glands are found hypertrophied to the size of a pigeon's and even to that of a hen's egg.

The phenomena presented by the *skin* are of inferior importance. At the commencement of the disease the skin is commonly moist; active sweating of the head is also observed; but, as the disease advances, the skin becomes dry, brittle, and furfuraceous, and no sweating takes place again until the fatal accelerations of the pulse come on, near the close of life. Sudamina are comparatively rare. The integument retains its susceptibility to counter-irritants up to the fatal end; the horrid anointings with ung. tartar. stibiat. or of sublimat., as well as the vesicators, act as promptly in hydrocephalic as in healthy children. So, too, the simple rubbing in of blue ointment, in children with a tender epidermis, produces the ordinary vesicular eruption.

In the French compendiums there is a description of peculiar meningitic spots (*taches méningitiques*); it is asserted that they originate when the integument over the chest and abdomen is scraped and much irritated with the finger-nail, and that they leave behind them scarlet-red streaks, which, in a few minutes, indistinctly merge into the surrounding rose-colored skin. I have often tried to produce these "meningitic spots," but have never been able to detect any thing more than a red streak, the same kind, in fact, as may be produced almost instantaneously by simply scratching any free part of the skin in a healthy individual.

These "meningitic spots" were discovered by *Trousseau*, who has enriched the Pædiatrica with many similar "discoveries." That red spots should originate on the skin, in consequence of local congestion, sometimes at one place and then again at another, but especially on the face, is a phenomenon that by no means belongs particularly to hydrocephalus. Their frequent occurrence here finds a very natural explanation in the unrhythmical pulse, and in the attending disturbances of the circulation.

Headache, likewise, is a prominent and tolerably constant symptom; but it does not come on so early as might be supposed, were we to judge from the primitive cause of the entire disease, which, in reality, is to be looked for in the meninges. Indeed, it is almost uniformly absent in the premonitory stage, as has already been stated. It comes on with, or a short time previous to, the vomiting, and soon becomes so severe that older children constantly cry aloud from pain. Younger ones pluck at the head and ears with their little hands, and restlessly toss the head about or rub it to and fro on the pillow. These manifestations of pain continue as long as the children are in possession of their faculties. Usually, no defined place on the skull is complained of; still, when asked concerning it, they will point, in the majority of cases, to the forehead. In younger children automatic movements occur, which also seem to be referable to the headache, and mostly consist in carrying one or the other little hand to and from the head with great rapidity. Generally, the pains do not intermit, but continue unceasingly till coma finally supervenes.

Older children remarkably often, still not regularly, complain of *abdominal pains*, especially in the epigastric region. These pains are materially aggravated on pressure, and may become so intense, whenever the stomach or any part of the abdomen is touched, that the patients utter loud, painful outcries. They do not, generally, persist as long as the headache, but they are apt to cease suddenly and to return. It is not always possible to attribute them to any pathological alterations of the intestinal mucous membrane. I have carefully examined the stomach and intestines in numerous autopsies of hydrocephalic children, in whom the abdominal pains were extremely well pronounced, but have never been able to discover any marked morbid changes.

The *shape* of the abdomen is extremely pathognomonic of the disease. At first nothing in particular can be observed; but, when vomiting, constipation, and the general hydrocephalic symptoms, have lasted for some time, the abdomen will daily become smaller, plaited, and depressed, and finally acquire the form of a boat. By very slight pressure, the abdominal aorta can be distinctly felt on the spinal column. This boat-shaped belly is generally explained by a paralysis of the abdominal muscles, which are said to simply overlie the contracted alimentary canal. This condition, however, is by no means produced by a paralysis, but by a permanent spasmodic contraction of the transversalis and oblique abdominal muscles, in which the muscular coat of the intestines also probably participates, for the intestinal tube is always found remarkably contracted. A certain degree of hardness and tension always remains in the abdominal parietes, even when this trough-like formation of the belly is extreme. On the other hand, a paralysis sometimes ensues in the last days of life, when the rigid depression of the abdomen disappears and the retracted abdominal walls become again soft and flabby. The case is different with the integument covering the abdominal walls. Paralysis affects it very early in the disease, as may be seen when a fold, having been raised by pinching with the thumb and forefinger, takes a long time to disappear.

The retraction of the abdomen is not absent in any case of hydrocephalus, and the description, *boat-shaped*, is very appropriate, for the symphysis pubis, the costal cartilages, and the ensiform cartilage, form high promontories, between which the contracted abdominal muscles represent a deep trough. *Gœlis* regarded this symptom as of especial importance, and believed that by it acute hydrocephalus could be distinguished from typhus fever with the greatest certainty.

As regards the external alterations about the skull, they can only be observed in cases of unclosed fontanels. These will bulge out more and more with the augmentation of the effusion, and exhibit distinct fluctuation. In cases where the fontanels are already closed, a peripheral circulation of the veins of the scalp sometimes becomes rapidly developed, the result of pressure by the effused fluid upon the sinuses of the dura mater.

The *psychical functions* experience disturbances very early in the disease, in a manner that has already been described more minutely in the stadium prodromorum. The confused, blank look, the morose, peevish, irritable disposition, or, in other cases, the utter indifference toward beloved persons and objects, are the most striking peculiarities. Later, when the rest of the symptoms have already placed the diagnosis beyond all doubt, actual delirium also supervenes, but generally of a quieter kind than in purulent meningitis of the convex portions of the cerebral membranes. Furious delirium in the course of acute hydrocephalus occurs only exceptionally, and for very short periods, and is soon followed by quiet, muttering delirium, and this by a permanent state of profound coma. The intensity of the delirium, and the nervous symptoms in general, according to the investigations of *Rilliet* and *Barthez*, and which I have often been able to confirm by dissections, are by no means in exact relation to the extent of the disease found in the meninges. In cases of violent cerebral symptoms, where a thick layer of exudation and a large quantity of miliary tubercles were predicted, *traces* of them only were found here and there at the autopsy; and, in cases where no delirium at all, and only coma, was present in the last period of life, large quantities of effusion and extensive miliary tuberculosis have often been observed.

A very common symptom is a loud, mournful cry, recurring at longer intervals, and which *Coindet* considers so pathognomonic of this disease, that he unhesitatingly describes it as the "hydrocephalic cry." These children also often repeat for whole nights, at regular intervals, some monosyllables in a plaintive voice, or repeatedly exclaim, "O my!" which is always accompanied by a loud, deep sigh. These symptoms of irritation, extremely distressing and annoying to the sympathizing relatives to witness, fortunately do not last, at the utmost, longer than six or eight days, and are followed by profound stupor.

When these children have once fallen into a state of coma, they never, as a rule, come out of it; sometimes, however, coma and delirium alternate, but the former always is predominant. *Rilliet* and *Barthez* report the cases as very rare in which perfect consciousness returned, only to be quickly succeeded by the previous coma.

The disturbances of the *locomotive apparatus* are extremely variable, and are not completely absent in any case of hydrocephalus, but they generally come on so late in the disease, that they can take but little share in the formation of the diagnosis. The stadium in which they appear is of great interest to the neuropathologist, and supplies some explanation of the innervation of different parts of the body. Convulsions and paralysis occur, the former preceding the latter, and it is necessary for us to distinguish between the general and local convulsions.

The *general* convulsions occur paroxysmally. At first the intervals between the paroxysms are long, three or four days frequently passing between the attacks. Generally, however, they recur oftener, and in some rare cases may last for many hours continuously. Usually, they begin at the inspiratory muscles, producing a suspension of the respiration, which is interrupted a few times in the minute by a rapid, incomplete act of breathing. They soon extend to the extremities, which are vehemently shaken by rapidly-recurring electro-tetanic jerks, which alternate with strong supinations of the forearms, and with opisthotonos. This very naturally induces marked venous stagnation; the face becomes red and even livid; the eyes injected, roll about in different directions, but mostly stare upward to such a degree that the pupil and but little of the iris are seen between the half-closed lids. After several minutes, sometimes after two or three hours, these general convulsions cease, when the patients, pale as death, sink into a state of the utmost prostration, and exhibit a marked aggravation of the general condition.

The *local* convulsions attack the most varying groups of muscles, most frequently those of the face. Here *distortions* of the *upper lip*, a *spasmodic smile*, and *peculiar sucking* acts, occur, by which the lips are kept in motion for hours. Strabismus is observed late in the disease; sometimes the child squints outward, and then again inward. The strabismus is often not permanent, but is subject to the partial irritation, or antagonistic paralysis of the various muscles of the eyeball, and in the last days of life it may disappear entirely.

This symptom, as has been said, comes on late; still, I can recall the case of a child which was brought to me simply on account of the daily increase of squinting. In the succeeding days other hydrocephalic symptoms steadily developed themselves, and at the autopsy a tubercle as big as a hazel-nut was found in one of the optic thalami.

Another peculiar symptom is the *gnashing of the teeth*, well known to and justly dreaded by experienced nurses. It also is due to a spastic contraction of the masticators, and is protracted till complete general paralysis takes place. Active partially automatic movements of the arms take place, and are described as twitchings, tremors, or startings of some of the tendons, while many hydrocephalic patients constantly keep their hands about the genitals and perform onanistic acts.

The lower extremities are less frequently attacked by convulsions than the upper; they are almost always in a semi-flexed and paralytic state; when spasms appear, they will be of the character of short tetanic jerks, during which the toes are widely separated.

The muscles of the *nape* and *back* are strongly contracted, and most of the subjects, when set upright or laid on the side, throw the head far backward. The tonic spasm of the abdominal muscles, by which the well-known boat-shaped belly is produced, has been already mentioned.

The *disturbances* of the sensibility, and the derangements that take place in the *organs of sense*, are no less remarkable. In most of the patients a decidedly heightened sensibility of the skin is observed at the invasion of the disease, which manifests itself by a greater susceptibility to external impressions. When raised from the bed ever so tenderly, or their posture changed however carefully, or the head, abdomen, or hands, touched ever so lightly, they will always resist and utter loud cries of pain. But this morbid picture changes rapidly as the effusion continues to increase, for paralysis of the nerves of sensation quickly ensues, and the child may be pricked, pinched, or handled, without any special care, may be treated with vesicants and irritating ointments, yet will make no opposition, merely manifesting by a low moan any pain it may suffer. The abolition of the sensibility is very strikingly shown in the conjunctiva, which may be stroked with the finger without causing the lids to move.

In addition to the strabismus, which has already been described in connection with the motor disturbances, and besides the blank, surprised look of the eyes, the *state of the pupils*, and the augmentation of the mucous secretion of the lids, are also worthy of notice. The pupillary contraction is very transient and by no means constant; generally the pupil has a tendency to dilate very early in the disease, and this dilatation perceptibly increases from day to day. Toward the end of the disease, the remarkable phenomenon of inequality of the pupils supervenes. Thus, in a child three years old, I noticed in its last days of life a unilateral dilatation upon the side on which it happened to lie, and at the same time a peculiar oscillatory movement of the same eyeball, while the pupil and globe of the opposite eye remained undisturbed. By laying the child on its other side, I succeeded several times, though not always, in producing these alterations in the eyeball which previously had remained tranquil, while the other ceased to oscillate.

The observation of *Brachet*, that, under the influence of a strong light, the pupils which are already dilated will contract for a short time, and in one or two minutes dilate again, notwithstanding the continuance of a still more intense light, I have often been able to confirm. But, in the last days of life, even the most glaring light fails to make an impression upon the pupils. The secretion of the conjunctiva and Meibomian follicles increases during the disease, and it becomes necessary several times a day to remove the accumulated masses of mucus which collect at the inner angles of the eyes.

The *hearing* seems to continue longer, for the children, until they are completely comatose, will rouse somewhat upon being called by name, and even when spoken to in a low voice. The taste and smell become abolished only toward the fatal end; for the child very decidedly objects to being rubbed with ointments of bad odor, and refuses to take unpleasant-tasting remedies.

As regards paralysis, it may be remarked that general, lasting paralysis, such, for instance, as occurs after a *commotio cerebri*, is never observed. Hemiplegia, on the other hand, occurs in some cases, and lasts till death. At the autopsy, in addition to the miliary tuberculosis of the meninges, one or several large, old, yellow tubercles are generally found within the brain. Most frequently paralysis of one or the other upper eyelid, or one half of the face, with participation of the muscles of the tongue, is observed. Paralysis of one of the upper extremities, and more rarely of one of the lower extremities, also occurs. The retention of urine in the last days of life is, as has already been stated, not to be attributed so much to a paralysis of the bladder as to a paralysis of the secretory nerves, for usually the bladder does not become distended so as to be felt above the symphysis pubis, and the catheter discovers no large quantities of urine.

Death, as a rule, ensues after violent convulsions of many hours' duration, and only exceptionally do the paralytic symptoms steadily advance to a fatal termination.

In the majority of cases it is very easy to make out an approximative diagnosis, but whether it is of a tuberculous, or simply of a purulent inflammatory nature, it is usually impossible to decide. In both processes, the cerebral symptoms are alike, only in the simple meningitis they come on much more rapidly and are more violent, terminate more quickly, and possibly may also end in recovery, while tuberculous meningitis must be put down as an inevitably fatal disease. More concerning this may be found in the section which treats of simple meningitis. With typhus fever it is scarcely possible to confound this disease, if any diagnostic skill at all be exercised. The diarrhœa, the tympanitis, the rapid pulse, and the splenic tumor, are such constant signs of typhus fever, while the retracted abdomen, the constipation, the manner of vomiting, the slow pulse, and the unrhythmical breathing, are such striking symptoms of hydrocephalus, that an error in the diagnosis can hardly happen. It is more probable that a chronic gastric catarrh, from which older children become emaciated, and with which some cerebral symptoms may also be associated, may mislead us, and cause the two diseases to be confounded. In the section on intestinal worms a case was related, where a child perished under hydrocephalic symptoms, and at the autopsy nothing but a large quantity of round-worms was discovered.

Although these cases must be regarded as extraordinary rarities, still we have seen that some verminous patients have wide pupils, that they vomit frequently, and even have slow pulse, and consequently we may easily be misled to entertain the supposition that we have an incipient though irregular hydrocephalus to treat.

What has been said hitherto has only reference to the completely-developed affection, not to the prodromata, which by no means admit of any diagnostic precision. This stage is, indeed, frequently confounded with commencing typhus fever, or with simple gastric catarrh, with helminthia and irregular and difficult dentition, and to these errors no doubt are also due the many reported cases of cured meningeal tuberculosis with hydrocephalic effusion. But the most essential points will always be found in the hereditary disposition, by the aid of which, in the doubtful cases, we are able to establish the diagnosis with tolerable certainty. If the father or mother, or one of the brothers or sisters, have already perished by tuberculosis, the probability that the doubtful symptoms belong to acute hydrocephalus becomes much greater than when no tuberculosis at all can be detected in the history of the family.

Termination and Prognosis.—I recollect to have had, at the very commencement of my professional career, a tolerably well-pronounced case of hydrocephalus, in which the child, after several weeks, was apparently perfectly cured. But the same boy, seven or eight years old, one year after his first sickness, again came under treatment, and then succumbed to a meningeal tuberculosis and extensive hydrocephalic effusion, which was demonstrated by the *post-mortem* examination.

In all the rest of my hydrocephalic patients, of which I have had at least thirty, death, when the symptoms once indicated cerebral dropsy, invariably ensued after two to three weeks. But, by thus defining the time, we do not intend to say that the disease will always run its course within such a period; for in no disease is it so difficult to determine the time of commencement as in the one under consideration. Formerly it was customary to date the commencement of the disease from the day on which the child took to the bed, but attentive mothers observe a whole list of symptoms for weeks and even months before this, which they are unable to explain, and for which they consult the physician.

As in my own experience not a single child has recovered from this disease, and only a single one has overcome one attack to perish from a relapse during the following year, I am forced to regard the prognosis as absolutely fatal. On the other hand, humanity, as well as policy, commands us to afford the relatives a ray of hope till the fatal end, for, by inspiring hope, the labor of nursing is vastly lightened, and you retain the patient, and thus keep it out of the hands of others who may manage it less humanely.

Cases are recorded which purport to be recoveries from acute hydrocephalus, and their truthfulness is vouched for by names of good repute. It is, however, hardly necessary for me to state that I have tried the treatment recommended in these cases with the utmost care and accuracy, and have, nevertheless, always experienced the same uniformly unfortunate result.

Treatment.—The only essential service which the physician is able to render in this terrible disease is to be sought for in establishing a strict prophylaxis in these tuberculous families. Every thing that is liable to produce cerebral congestion must be strictly prohibited. Such children must not be mentally overtaxed, nor allowed to exert their faculties for any length of time continuously. They should not play at wild, boisterous games, should not run long nor rapidly, nor jump, nor dance, etc. Their heads should always be cool, and be well protected against the direct rays of the sun. In general, all those precautionary measures to be hereafter recommended, in tuberculosis as a dyscrasia, are to be scrupulously observed. Especial attention is to be bestowed upon the state of the bowels, for constipation is well known to be a frequent and an active cause of cerebral congestion. The stools, however, should never be promoted by any drastic cathartics nor neutral salts, but those nutriments which experience has proved to be constipating should be avoided, and a free use made of those that are known to possess slightly-laxative properties. From the earliest time to the present, it has been a subject of dispute whether scrofulous affections, particularly humid eruptions of the head and face, have any connection with hydrocephalus, for almost all the children of tuberculous parents suffer from these cutaneous eruptions. Formerly it was unanimously conceded that they ought not to be treated except so far as cleanliness demanded, for it was observed that, after a certain time, occasionally not till after many months, these eruptions ceased to discharge, formed dry crusts, and when these fell off the normal cutis was seen beneath free from any visible cicatrix. There is no doubt that our predecessors in therapeutics, who were indisputably more officious than the present generation, and knew as well as we do that the cure of an impetigo is very much promoted by solutions of nitrate of silver and corrosive sublimate, by lead-water, and zinc-ointment, came through unpleasant experience to the conclusion that it was safer to discard these decidedly efficacious remedies. Of late, such a precaution has generally been regarded as disadvantageous, and scrofulous eruptions of the head are removed as quickly as possible, a practice which I too favored for a long time. But it has happened to me twice that children, in whom extensive eruptions of the head dried up suddenly, were at the same time attacked by hydrocephalus. Consequently, since that time, I have entirely renounced this desiccating treatment. Of course, I do not intend to declare that there is an actual connection between eruptions on the head and acute hydrocephalus, for to establish such a connection those two cases are by no means sufficient, and may be contradicted by many hundred others, in which the eruption of the head dried up rapidly without being followed by any ill effects. But, since it has also been proven by an equal experience that they heal spontaneously without any thing at all being done for them, it follows that an expectant treatment will probably do no harm, and that possibly something beneficial might, in the end, be gained by it.

But what treatment are we to institute when the first symptoms of hydrocephalus have actually appeared? The answer may be readily divined by recalling what was said as to the prognosis. In few diseases is it possible to pronounce all remedies so positively ineffectual as in the one under consideration; and, if in the remainder of this section the various methods of treatment hitherto proved to be useless are but briefly described, it is not with the intention of challenging observation, but rather for the purpose of showing the therapeutist how much has already fruitlessly been tried in this fatal disease.

In the first days of the disease, derivatives upon the skin are in special favor; a seton in the nape of the neck, large pea issues in the arms, a blister kept in a constant state of suppuration, pustulating ointments of tart. emetic or sublimat., cauterizations with potassa fusa, all serve the same purpose, to wit, to produce a severe cutaneous irritation, with as profuse subsequent suppuration as possible.

That the antiphlogistic method of treatment has been employed with various degrees of vigor, and in every stage, is well known. Leeches have been applied to the temples, behind the ears, on the nape, at the anus, between the thighs, and large or small venesections in the arm, foot, and jugular vein. Ligature of the carotids even has been proposed, but I am not aware of its ever having been performed.

The application of cold has also been tried in various ways. The ordinary cold-water compresses are constantly kept on the sheared or shaved scalp, a bladder filled with ice is laid upon the head, the head is washed or douched two or three times in the hour with cold water, and an apparatus even has been invented for the purpose of keeping up an uninterrupted irrigation. To the first measures there is nothing objectionable, but the irrigation plan is an altogether too elaborate for practice.

"For this purpose," according to *Bouchut*, "the neck of the child is wrapped around by a water-proof cloth, which communicates with a gutter on each side of the bed. A thin stream of water is allowed to flow down upon the head of the child from a reservoir suspended over it, and is carried off in the gutters above mentioned." Whether hydrocephalic children will quietly submit to be thus showered, is not stated, but to me it appears extremely improbable.

Among the remedies capable of bringing about an absorption of the deposited exudation, mercury and iodine rank first, and the diuretics next. Of mercurial preparations, blue ointment, corrosive sublimate, and calomel, are most frequently resorted to; the last two are given in large doses, so as at the same time to operate on the bowels. Even tartar emetic, as high as several grains daily, has been administered as a general alterative remedy. Phosphorus also has been tried, on account of forming one of the component parts of the brain. Of the diuretics, nitre, digitalis, squills, and juniper—of the antispasmodics, assafœtida, camphor, moschus, castoreum, have been used. In restless, delirious children, opium has been given with marked tranquillizing effect, but the majority of physicians dread the paralyzing action of this remedy, and too readily believe that the steadily-increasing deterioration of the patients is in part caused by the opium. But he, who has seen a number of such cases perish without narcotics, will administer opium, or, still better, morphine, without timidity and without suffering any compunction of conscience, in cases of great restlessness and severe headache.

The short but extremely sad *résumé* of the whole treatment then is, that at first the treatment, as for a simple, non-tuberculous meningitis, is mildly antiphlogistic, with small doses of calomel, blue ointment, and cold ablutions of the head, and perhaps also by the application of moderately-active cutaneous irritants, and nervous excitement is tranquillized by morphine. Torturing, violent applications are to be avoided entirely, for their inefficiency has often enough been made evident, and it is admitted that methods of treatment which torture are only permissible when there is any hope of benefit. And yet, in a disease that is universally regarded as fatal, all possible therapeutic experiments are practised.

(2.) MENINGITIS SIMPLEX, PURULENTA, AND ENCEPHALITIS—(Simple Inflammation of the Meninges and the Brain).—Although chronic hydrocephalus very naturally ranges itself with the acute, still a few words may be said here of simple meningitis, on account of the many analogies between it and the preceding disease.

It is a much rarer affection than acute hydrocephalus, and occurs no oftener in children than in adults. In this disease, portions of the brain proper in proximity with the meninges almost always are involved, and, as inflammation of the meninges cannot be clinically distinguished from congestion and inflammation of the cerebral substance proper, it is, therefore, best to describe these different morbid processes in one clinical discourse.

Etiology.—Occasionally the causes of this disease can be ascertained with great accuracy. The usual causes are traumatic—cerebral concussion, which, on account of the liveliness and awkwardness of the child, often enough occurs, injuries acting directly upon the cerebral substance, great heat and cold, insolation, immoderate mental exertions, and the propagation of inflammation from adjacent organs. The most frequent cause in this respect is otorrhœa; less frequently the meningitis takes its source from an ozœna, or from an inflammation within the orbital cavities. Meningitis also occurs after erysipelas, but, in the majority of instances belonging to this class, the erysipelas seems to be of a traumatic nature, and hence a purulent absorption through the osseous vessels must be assumed. Those cases of meningitis following metastases, repercussed cutaneous eruptions, suppressed epistaxis, etc., are mostly problematical, though even for these some very reliable vouchers are found in medical literature. At certain times this disease has been seen to appear in an epidemic form.

Pathological Anatomy.—The dura mater participates in the inflammation in traumatic cases only, and in these the morbid process always remains circumscribed, and produces a flat, fibrinous, or purulent layer of exudation upon that membrane. In chronic cases, which in children are very infrequently observed, the dura mater becomes markedly thickened, and thrombi form in one or the other of its sinuses. In simple meningitis the inflammatory exudation is located between the arachnoid and pia mater, and penetrates deep into the convolutions and depressions of the brain. As an important distinction from tuberculous meningitis, it is never found so diffused over the base of the brain as upon the upper surfaces of the hemispheres. It, however, extends down over the spinal cord, and thus adding meningitis spinalis. The exudation is yellow, yellowish green, fibrinous, or purulent, and is scarcely ever more than a line in thickness. It is either bathed in a large quantity of turbid, opaque serum, in which it often liquefies, and then becomes converted into a flocculent, greenish, glittering fluid, or it is poor in serum and rich in fibrin, so that, when the arachnoid is pulled off, this false membrane partly remains hanging on to the arachnoid membrane and partly to the brain. The peculiarity is also worth mentioning, that acute hydrocephalus never occurs in combination with simple meningitis, but invariably supervenes upon tuberculous basilar meningitis. This is due undoubtedly to the fact that in the former the direct continuation of the pia mater into the cerebral cavities is free; in the latter, on the contrary, only the base of the brain becomes the site of the gelatinous mass of exudation. The outer stratum of the brain-substance may be involved and softened, or it may be in a perfectly normal condition.

This simple meningitis, which occurs in an extremely acute form, though generally terminating fatally, cannot, we may judge from the distinct traces of resolution occasionally found, be regarded as a hopeless disease. In the favorable cases the exudation becomes transformed into a fibrous structure, the pia mater into a milk-white, firm membrane, and becomes united with the cerebral cortex on the one side, and with the arachnoid on the other.

Symptoms.—Simple meningitis, when it is not of a traumatic origin, or is the result of an otorrhœa, attacks almost exclusively well-nourished, robust children, which bear no trace of scrofula. In cretins, who are not infrequently victims of this disease, the autopsy exhibits, conjointly with the old hypertrophies of the meningitis, a freshly-deposited exudation, so that the fatal disease in such case must be regarded as a relapse of the former meningitis. The commencement of the disease is extremely acute, and, by the second or third day, the process has already attained to its climax. All the prodromata that have been described in connection with hydrocephalus acutus are totally absent here. But a hydrocephalus that has already reached its acme can no longer be diagnosticated from a meningitis of the hemispheres, and only the course of the two diseases furnishes the requisite data for a differential diagnosis.

In simple meningitis, as well as in the tubercular form, vomiting without retching, constipation, slow pulse, unrhythmical respiration, violent headache, retracted abdomen, and the whole train of nervous disturbances which have been more minutely detailed in the preceding section, occur. The following distinctions, however, may be made available: The course of meningitis simplex is more rapid, for death usually ensues between the third and sixth day after the invasion of the disease, and the temperature of the skin, particularly on the head, is correspondingly more elevated. The delirium is extraordinarily severe, even furious; the face has a wild, confused expression, and the convulsions and contortions of the body are of extreme severity. The pulse is less retarded than unrhythmical, the vomiting is not so constant, and may even be entirely absent.

When such children do not succumb to the meningitis in the first few days, the symptoms will abate very gradually, and recovery may be hoped for; but, as the diagnosis between the disease under consideration and acute hydrocephalus is difficult, recovery must continue extremely doubtful. A marked emaciation supervenes, and a mental weakness is liable to follow, a result which I have twice witnessed in my own practice. The great similarity in the termination of meningitis and of hydrocephalus makes the assertion, that acute hydrocephalus is sometimes curable, quite excusable, for it is indeed possible, although very improbable, that children of tuberculous parents may exceptionally acquire a simple meningitis, from which perchance they may recover.

Treatment.—In this disease, a mercurial treatment is decidedly effectual, the two children which I saw recover having been treated exclusively with mercury internally and externally. For this purpose, a drachm of blue ointment is rubbed in daily upon the sheared head, and gr. ss. of calomel is given every hour. In both children the disease had reached a most critical degree, as evinced by cerebral vomiting, unrhythmical pulse, retracted abdomen, and convulsions. Severe stomacace supervened, however, on the third day, and, immediately upon that, a gradual abatement of all the symptoms followed. Cold affusions of the head, repeated every two or three hours, exercise a very favorable influence upon the delirium. These are best performed by wrapping the breast and arms of the child in a shawl or cloth, the head is then held over a basin, and cold water is poured upon it from a moderate height for one or two minutes. A mitigation of the cerebral symptoms, although only temporary in its duration, always follows this proceeding.

Five children I treated with leeches, but all succumbed to the disease. As sudden blanching of the lips and rapid pulse followed the loss of blood so directly, they were regarded as the effects of this procedure. On the other hand, in those two children which recovered, no leeches were employed, and therefore, according to my own experience, I have to regard the treatment without leeches as the correct one. The stomacace and salivation, occurring as the effects of mercury, cannot be regarded as critical, though they may appear in cases which terminate fatally on the second day. Generally, it is easily recovered from by the administration of chlorate of potassa, of which a drachm, dissolved in several ounces of water, may be consumed every day.

Some maintain that, in cases of great excitability, opium should be used in combination with mercurials, but I am unable to approve of this; on the contrary, my experience leads me to consider narcotics as contraindicated in this terrible disease, which rapidly destroys by paralysis. I am the more opposed to the use of narcotics, that we possess in cold such a valuable remedy against the excitability.

Compression of the carotids with the thumb and index-finger against the spinal column, or the lateral walls of the larynx, for a minute or two, repeated several times a day until the head symptoms abate, has been highly recommended in France.

That this compression, when feebly executed, is only an illusory remedy, and when forcibly performed is apt to compress the jugular vein rather than the carotid artery, and thus in the end do more harm than good, has been conclusively proved by *S. Lewis.* This measure, therefore, has nothing but an historical interest.

The marked emaciation, which is the result of a meningitis, must be treated by a nourishing diet, by stimulants, iron, quinine, etc. For the mental weakness, which this disease in most cases leaves behind, there is no other remedy, to my knowledge, than mental rest, along with a tranquillizing, psychical treatment.

(3.) INSOLATIO—SUNSTROKE.—Insolation may next engage our attention, very properly ranking next to purulent meningitis, although the pathological anatomy exhibits no direct connection between the two diseases. In the former no purulent effusion is found upon the meninges, only intense injection, a slight augmentation of the reddish contents of the ventricles, and softening of the cerebral substance.

Symptoms.—Children who, with uncovered heads, have exposed themselves for some time to the direct rays of the sun, return to the house with flushed face, reddened neck and arms, and soon complain of an intense headache. The red color of the parts of the skin mentioned does not disappear, as after simple overheating, but remains for many days in the shape of small, elevated erythematous spots. After several hours delirium comes on, often of a violent nature, with the development of an excessive muscular power, flushed face, injected eyes, contracted pupils, strong pulsation of the carotids, hot skin, dry tongue, and intense thirst. With this array of symptoms, a severe meningitis may well be suspected, but the pulse is very much accelerated, and, in the majority of cases, rhythmical, while in the purulent meningitis it often becomes retarded, and sometimes is unrhythmical. Vomiting also is absent, unless undigested food exist in the stomach.

The course of insolation is quite different from meningitis. After a half a day to at most two days, all these symptoms disappear. The child, at first, falls into a restless, then into a profound sleep, and wakes from it with complete consciousness, and, at the end of two or three days more, the health is fully reëstablished. But instances have occurred where death took place at the very commencement of the attack. These cases, however, form the exception, and are rarely met with in our moderate climate.

Treatment.—Venesection, it is true, produces some abatement of the symptoms, but, in consequence of the furious delirium, it is impossible to perform the operation, and the use of leeches is opposed by the same condition. The best and quickest means is always to cut the hair as short as possible with a few sweeps of the scissors, and then apply the cold douche to the head every hour. This procedure invariably produces a decided moderation of the furious symptoms. Ice may be applied to the head, sinapisms to the extremities, calomel and jalap may be given internally, and stimulating clysters administered. Almost all children recover from this seemingly extremely dangerous condition.

(4.) HYDROCEPHALOID AND IRRITATIO CEREBRI.—*Marshall Hall* found some resemblance between acute dropsy of the head and the symptoms originating in atrophic children due to anæmia, and on that account called the latter condition hydrocephaloid disease. This disease, although in no way based upon pathological anatomy, has been admitted into all the text-books, and I shall therefore also give it a brief discussion here. Although it is not a distinct disease, but rather a termination of such, still, the name deserves to be retained, if it were only for the sake of convenience, in order to describe a whole group of symptoms by one word. By irritatio cerebri, therefore, is understood almost exclusively those cerebral symptoms which commonly supervene in consequence of interrupted nutrition, or of atrophy, so that the symptoms of hydrocephaloid and of irritatio cerebri may, with the utmost propriety, be considered together.

Symptoms.—After various exhausting diseases, generally such as diarrhœa, abstraction of blood, etc., children under one year of age are seized with a class of cerebral symptoms which, at first sight, without due reflection, might certainly give rise to the thought of a material alteration, an exudation in the brain. The most striking of these symptoms is an incessant rubbing to and fro of the head, or a boring of it into the pillow, by which the occiput is wholly deprived of hair, and small abrasions of the scalp, loss of epidermis, and furunculosis often result. Many children also pluck the head with their hands, pull the hair and ears, and scratch their faces until they bleed, and cease to notice the objects by which they are surrounded. The eyelids are half closed, and, in the majority of cases, the globe is rolled upward. The upper extremities are in a constant state of rigid flexion. The thumbs are drawn into the palms, and the fists closed so firmly that considerable strength is requisite to open them, and the palms of the hands become denuded of epidermis. This latter sign is especially observed in children who frequently handle the fermenting sugar-teat. The lower extremities are likewise rigid, either extended or contracted, and the muscles of the nape of the neck are so firmly contracted that, if the child be laid upon his side, the body will curve far backward. Occasionally, particularly toward the latter end, tetanic spasms supervene. Almost all these children vomit immediately after food or drink has been administered—a fact which gives this disease a resemblance to an exudative cerebral affection. It is also true that this vomiting occurs without retching or exertion (as is generally the case in young children), but it has its foundation in an irritable state of the gastric or intestinal mucous membranes. On examining the heads of children, who, in consequence of profuse diarrhœa, have become atrophic, and in whom these cerebral symptoms have appeared, the temperature will be found to be elevated, the anterior fontanel depressed, the cranial bones overlapping each other; in short, all the signs of such an extremely aggravated state of cerebral atrophy that we are enabled with the utmost certainty to prognosticate a fatal termination. Constipation is of more frequent occurrence than diarrhœa; but, should the latter exist, it is never copious; the appetite, in most cases, is slight, though sometimes a wonderful greediness comes on, and continues almost till death. The pulse, unlike that in genuine hydrocephalus, is extremely rapid, and the respiration, although unrhythmical, still almost always perceptibly accelerated. At first, the child will cry incessantly for several days and nights; toward the end it is only able to utter a low groan, or single abrupt cries.

Autopsy.—The brain is found softened and watery, the gray substance pale and not sharply defined, but passes gradually into the white portion. The meninges are infiltrated with serum, and in the ventricles only the normal amount of fluid is found. It is probable that the quantity of fat in the brain has become decidedly diminished, and in this manner the cerebral symptoms may be explained. I am not aware that any chemical investigations have been instituted in this direction.

Treatment.—Every thing that has already been recommended in the treatment of intestinal catarrh and enteritis folliculosa is applicable here; and the reader is therefore referred to that section. To counteract the continuous crying and sleeplessness, cold ablutions of the head, applied by the naked hand, the keeping of the body dry and warm, are, as yet, the only means worthy of recommendation. After the ablutions, rest for one or more hours usually ensues. The only active remedy capable of restoring such an extremely prostrated nutrition is, the breast of a healthy wet-nurse, the only precaution necessary to take being, not to wean the wet-nurse's child until the sick child is able to suck, which will often take several days. The necessary consequence of neglecting this precaution would be to subject the wet-nurse to sickness, a mastitis, or a suppression of the milk.

(5.) Hydrocephalus Chronicus (Chronic Dropsy of the Head).—Theoretically, an *external* and an *internal*, a *congenital* and an *acquired chronic dropsy* of the head are distinguished. Practically, however, these forms cannot be separated from each other, for it is impossible to assert, especially as regards the latter distinction, whether the child came into the world with a small effusion which subsequently increased markedly, or whether it was first formed perfectly normally, and only latterly became hydrocephalic. The external dropsy of the head is almost always congenital, and usually complicated with hernia of the brain, and on that account will be returned to further on.

Pathological Anatomy.—The most extensive effusion into the ventricles takes place in the fœtus, and the delivery often becomes impossible till perforation has been resorted to. In congenital dropsy of the head, the quantity of the water may increase to several pounds, according to some authors even to ten pounds. The ventricles are distended into large sacs, and their upper walls so attenuated that they rarely measure a line in thickness, or they may be reduced to so thin a covering that it is impossible to dissect it off. The convolutions of the cerebrum are faintly marked on the upper surface of the brain, may be perfectly smooth, and the meninges extremely attenuated. The deformity of the cranium corresponds with the quantity of water within it. The ossification of the cranial bones, naturally, is very much retarded, the sutures become wide enough to admit a finger, and the anterior fontanel attains a diameter of several inches.

Should life last for several years, an ossification finally takes place; it is effected by the bones sending out from their borders long radiating projections toward each other till they become united, and thus form excavated shallow sutures between them; or, finally, they may be united by a number of ossa triquetra becoming developed in the fontanels and between the separated bones. As these forms of union never proceed uniformly, one suture becoming closed on one side earlier than upon the other, marked malformations of the skull result, to which *Virchow* in particular has directed his attention. The most common abnormalities deserving to be mentioned are, the immoderately long, broad, high, round skull; the blunt, quadrangular cranium; and the cranium that slopes in the direction of the transverse or longitudinal diameter. The effused fluid acts no less strikingly upward than it does downward. The corpus striatum and optic thalami are flattened and forced asunder by the dilatation of the third ventricle, while the floor of the latter is very much attenuated and has become transparent. The corpora quadrigemina, through the same cause, are flattened, the commissures mangled and attenuated, the crura cerebri forced asunder, and the septum ventriculi broken through in many places. The cerebellum is diminished, out of proportion to the cerebrum, and flattened; also the pons Varolii and the pineal gland.

In *acquired hydrocephalus*, or that variety which develops itself in children who, from several months up to many years of age, enjoy a perfectly normal physiological development of the skull, the morbid alterations are less striking. The quantity of the serum in these cases depends upon the formation of the cranial bones; whether any and which sutures are ossified; and whether, at the commencement of the accumulation of fluid, a divergence of the bones can take place. The quantity of serum in these cases does not generally amount to more than from three to six ounces, and the alterations of the shape of the skull and brain, of course, never become so marked as in the congenital dropsy, which, after birth, continues to grow rapidly. The description of the external forms of the skull will find a more appropriate place in the section on Symptomatology.

Among the causes of chronic hydrocephalus, neoplasms in particular deserve to be mentioned, by which a sinus is made impermeable, and thus the accumulation of the serum is produced. Certain other complications, which could be brought into direct connection with hydrocephalus, tuberculosis particularly, so common in the acute form, do not here exist.

The chemical analysis of the effused fluid has taught us that the dropsical serum possesses very similar properties to that of acute dropsy of the head. Its reaction is alkaline, a trace of albumen is found, and the proportion of potassium to sodium is different from that found in the blood-serum. This subject is treated in detail at page 341.

Symptoms.—On examining the skull, marked deviations from the normal form are found. The earlier the hydrocephalus begins, the larger will the cranium become; it is largest where the process begins *in utero*, and smallest in the cases occurring after closure of the sutures. The earlier the exudation, or, more correctly speaking, the augmentation of the physiological exudation of the fluid contents of the cerebral cavities, occurs, the more pronounced will be the globular form of the skull; the later this happens, the less will be the deformity. If some of the sutures have become ossified, while others are still in a distensible condition, the skull will always be *elongated* in the direction of the *closed suture.* For the purpose of making the case complete, it is well to institute measurements of the enlarged skull, by which the largest circumference (that which passes over the frontal prominences), the distance from one ear to another, and from the protuberantia occipitalis externa to the root of the nose, may be ascertained. Practically these measurements have but little value, for the arching of the forehead and the attitude of the temporal bones furnish sufficiently accurate data by which to judge of the degree of the abnormal enlargement. They may, however, serve to instruct us as to the rapidity with which the disease progresses, for thereby it is strikingly seen that the distention of the cranium does not take place uniformly and gradually, but by fits and starts, the disease often being at a stand-still for long intervals. If the anterior fontanel is still ununited, as is the case in most instances, it will become distended to a great vault of several inches in diameter, will fluctuate distinctly, and feel tense. This arching and tension always continue until death, even when the body in general is very much emaciated. The synchronous rising of the fontanel with the pulsation of the radial artery can be very strikingly noticed, while its elevation and depression with the respiration are totally abolished. Great attention has been for some time bestowed upon the auscultation of the anterior fontanel, and it has certainly been clearly shown that a slight breathing or blowing murmur is perceived over various places on the skull, particularly over the large fontanel of rachitic children, but never heard in hydrocephalus. It is very easy to understand why these blowing murmurs disappear in cases of hydrocephalus, as they most probably originate in the unequal sinuses of the dura mater, and these must become seriously compressed by the increasing quantity of the water within the skull. The best index is the position of the temporal bones. While, in the healthy child, they stand perpendicularly, in the hydrocephalic child they diverge greatly at the upper part, so that, in extreme cases of serous distention, the auricle is hid from view when looking down upon the head. After the disease has existed for some time, the upper wall of the orbit, through the continuous pressure of the brain, becomes flattened, and, as a result of this, the eyeballs protrude more and more, until the whole cornea, and even the upper segment of the sclerotic is exposed, a condition that gives a peculiar glaring and unnatural look to the features. From the same cause, augmented pressure within the skull, a strong collateral circulation occasionally also forms in the scalp and frontal integument, the distended vessels appearing as tortuous blue cords. This discoloration produces a singular appearance. The face, as contrasted with the dimensions of the vertex, appears extremely diminished, but, aside from that, retains its normal proportions. In most cases in young children, with congenital hydrocephalus, it is very lean, sharp, and has a senile appearance; while in older children it may remain plump and round until death.

The *functional disturbances* are numerous, and vary in almost every case. In the acquired form these symptoms come on either very gradually, or are ushered in by a fever and a few phenomena, such as occur in acute hydrocephalus—outcries, vomiting, headache, gnashing of the teeth, and delirium. The mental capabilities sometimes remain unaffected for a remarkably long time, and it is sad to behold the little sufferer, who, with a monstrous head, suffering involuntary fecal and urinary evacuations, with limbs paralyzed or contracted, yet answers all questions rationally, and even reasons acutely. In some cases, however, mental aberration is among the early symptoms, ending in imbecility. Of the senses, that of vision most frequently disappears first. The pupil becomes moderately dilated and fixed, and the sensibility to light so totally lost that children will gaze for a long time, and sometimes prefer to look directly at the sun. Strabismus is of less frequent occurrence in this form than in the acute hydrocephalus. A nystagmus of one or both eyeballs is oftener observed, and the pupils at times are unequally contracted or dilated. The other senses, in most cases, remain up to a brief period before death; this is especially true of the sense of hearing. The sensibility of the skin is diminished or abolished, especially in the paralyzed extremities. Hemiplegia occurs less frequently than bilateral paralysis, the lower extremities being the most frequently affected. This is followed by an insensibility, then a paralysis of the sphincters of the bladder and rectum, thus making the care of these children extremely laborious. Bed-sores are unavoidable; yet, as they fortunately accelerate very much the termination of the little patient's sufferings, are blessings in disguise. Contraction of the muscles is of frequent occurrence; convulsions are occasionally observed, and death may occur during a fit. The remainder of the phenomena, which characterize an attack of acute hydrocephalus, as a rule, are absent in the form of disease under consideration. The respiration, which, in the former, is distinguished by the absence of the rhythm, in the latter is normal; likewise the retardation of the pulse is not ordinarily met with here. The digestion may remain perfectly normal, no vomiting and no constipation ensuing; or, if they do occur, they are only temporary. This explains the continuance of a good state of nutrition sometimes for years. If no other disease, such as tuberculosis or intestinal catarrh supervene, the nutrition will not be impaired; the appetite often becomes of a voracious character. The adipose tissue of the body becomes abnormally augmented. The patient complains only temporarily of headache, and febrile attacks are often due more to accidental intercurrent affections than to hydrocephalus *per se.* Acute accessions may cause, for a few days, the very picture of an acute hydrocephalus, still the deterioration does not progress as incessantly as in this latter condition, for a stasis occurs in the critical symptoms, and the disease again assumes its chronic character.

The *course*, as may already have been inferred from the preceding history, is of a chronic nature. Large congenital dropsies of the head are quickest terminated; they, indeed, are exposed to the greatest danger during the delivery, and only very exceptionally endure the injurious effects of pressure during that act. Very moderate effusions, which have been acquired much later, are tolerably well borne for many years, and such persons may attain to a middle age; indeed, a case of hydrocephalus is recorded which died at the age of fifty-four years.

Death may occur as an immediate effect of the cerebral lesions, from convulsions or increasing coma and collapse, where, at the autopsy, fresh meningitis or meningeal hæmorrhage may be found conjointly with the effusion. Bed-sores and their sequelæ, pyemia and exhaustion, may furnish the next cause. The subjects, in the majority of cases, however, die from intercurrent affections, chiefly from intestinal catarrh and enteritis folliculosa, or during dentition, from pneumonia, meningitis, or an acute exanthema. These affections in chronic hydrocephalus oftener terminate fatally than in previously healthy children.

The differential diagnosis in the well-pronounced cases has no difficulties, a diagnostic error being wholly improbable. Small collections of water, on the contrary, by no means furnish very striking symptoms, and may be very easily confounded with rachitis of the skull, or with simple hypertrophy of the brain and of the cranial bones. The main distinction between chronic hydrocephalus and rachitis of the skull consists in this, that the temporal bones in the former are always directed outward, while in the latter disease they stand perpendicularly, even when the anterior fontanel has become very large. All the hydrocephalic functional symptoms are absent here, and the attenuation of the skull itself generally is not found diffused over the whole surface, but confined to the posterior parts, while the frontal bones display the usual rachitic hypertrophy, and the remaining portions of the skeleton, thorax, and extremities, are similarly affected. Cerebral hypertrophy is likewise unaccompanied by any of the hydrocephalic symptoms. It almost always originates in consequence of rachitis of the skull, and the bones are markedly hypertrophied. But, after all, we are entirely unjustified in speaking of hypertrophy of the brain from mere eye measurements, so long as no accurate weighings of the brain, in comparison to the entire weight of the body, have been instituted, and the medium number fixed upon.

Therapeutics.—I know, indeed, certain children with chronic hydrocephalus, in whom no augmentation of the serous effusion has taken place for years, and who are in a tolerably good state of mental and corporeal development, but that an actual cure ever was accomplished, so as to secure the social usefulness of the patient, we have no proof. To keep these children alive as long as possible; they must be carefully nursed, and their diet accurately regulated. Though the action of diuretics in promoting the absorbing of the hydrocephalic fluid, and its subsequent elimination, seems to be extremely problematical, it appears proper to give them. For this purpose such only should be chosen as exercise no general weakening influence, for example, juniper, digitalis, acetate of potash; iodide of potassium, mercury, tartar emetic, and drastics generally, are to be avoided. A tonic and stimulating treatment cannot be injurious, particularly when proper attention is at the same time paid to the condition of the bowels. Locally, the most various ointments and fomentations have been employed, and, so long as the children are not tormented with them, they are not objectionable. The continuous strapping of the head for years with adhesive plaster, so warmly recommended by *Englemann*, as well as the puncturing and evacuating of the contents of the ventricles in those cases where the fontanels are still unclosed, has been tried by a few surgeons eager to operate, and has been abandoned because of its total inefficacy.

(6.) ENCEPHALOCELE (Congenital Hernia of the Brain).—Hernia cerebri is always congenital, and produced by an immoderate distention of the brain, as an effect of which the proper development of the cranial bones cannot take place. In these cases a tumor is found immediately after birth on some part of the skull, most frequently in the occipital region, and, on examining the parts more closely, the bones will be found to be annularly defective. The size of this tumor varies between that of a child's head and a small nut, and chiefly consists of the water which in all cases surrounds the prolapsed portion of the brain. The narrower the bony chasm, the more pediculated will be the tumor; and the wider it is, the more flattened the prolapsed part will be. Its covering consists of an atrophic, hairless cutis, which is united with the pericranium and the meninges. In large hernia, the integument may be so atrophied that the sac bursts from pressure at the delivery, whereupon death is the immediate result. Hernia cerebri occurs most frequently at the occiput, upon or beneath the posterior fontanel. It also occurs at the root of the nose, or angle of the eye, at the anterior fontanel, and very rarely through the temporal bones. When it makes its exit at the root of the nose, the nasal bones will be found forced asunder, and the distance between the eyes increased.

By compression the tumor may be entirely reposited, or considerably diminished, but the procedure always induces pain, and, when the pressure is kept up, may give rise to cerebral phenomena, such as convulsions, tetanic spasms, stupor, and syncope. In small tumors, with tough coverings, an early death is by no means an absolutely necessary occurrence. But the growth of the tumor, which always keeps pace with the other portions of the body, exposes it to almost unavoidable contusions and other injuries, which give rise to a chronic meningitis, and thus it happens that it is one of the rarest occurrences to meet with an adult or a child with hernia cerebri of several years' standing. Although life, with very great care and attention, may be preserved for a few years, still, the mental developments remain very much retarded, and imbecility is invariably the result.

Treatment.—In very small, entirely reducible herniæ, a radical cure is said to have been effected by the continuous maintenance of the sac within the aperture till it is closed by bony deposit. When the reposition is not complete, as is generally the case, and when severe cerebral symptoms are induced by the reduction, we must be content with simply protecting the dangerous spot from external injuries by a hollow piece of lead, or a properly-constructed leather covering. By this means the sufferer may live to an advanced age. Among the anatomical collections in this place, is a skull of an adult, on the occiput of which is an opening the size of a penny. The edges of this opening are round and smooth, and its history states that during life a cerebral hernia protruded through it. The removal, or the deligation of such a hernial tumor, according to *Bouchut*, always gives rise to a fatal meningitis. Consequently, the operation should be totally discarded. Better results may be expected from puncturing the tumor with a trocar, or, still better, with a simple needle introduced a number of times, and thus evacuating the contents. By this means we may often succeed in so diminishing the size of the tumor that a protective instrument may be applied, which otherwise would have been almost impossible. Though the secretion accumulates again after the puncture, the hernia, after the operation has been repeated six or eight times, remains permanently reduced in size, and a marked improvement in the whole condition is brought about.

(7.) SCLEROSIS OF THE BRAIN.—Induration of the brain in children is extremely rare. *Rilliet* and *Barthez*, and *Weber*, have reported single instances only. The sclerosis of children, like that of adults, either involves the whole brain, or only small portions; the degree of induration fluctuates between an almost imperceptible hardness and a cartilaginous consistence. In the latter case, it is always combined with atrophy, loss of substance, and textural alteration. A slight degree of general induration occurs more frequently than any of the other forms, such as is sometimes found at the autopsy of fatal cases of scarlatina and typhus fever. The rarity of the partial induration is readily explained by the circumstance that cerebral apoplexy in childhood is extremely rare, and that its resolution is the principal cause of this induration. In somewhat extensive meningeal hæmorrhage, or purulent meningitis, the adjacent parts of the brain usually participate, and the sclerosis then forms the *finale* of these processes. These cases are characterized by an almost cartilaginous hardness, the indurated portions presenting a dirty, grayish-yellow color, which, to a great extent, takes the place of the gray substance, though the white substance also becomes more or less affected. Carcinoma of the brain, whose nature will be discussed in one of the following sections, should not be confounded with this induration. This cerebral sclerosis possesses little else than anatomo-pathological interest, for the symptoms produced by it are not characteristic, and, consequently, no one is capable of diagnosing it. The symptoms it may occasion are epilepsy, idiocy, and neuralgia of various kinds.

Treatment.—This must naturally be directed to the symptoms. The cure of the induration has never, to my knowledge, been accomplished. Narcotics, nervines, and tonics, will be the agents, according to circumstances.

(8.) NEOPLASMS OF THE BRAIN.—Adventitious growths are by no means of rare occurrence in the infantile brain. This is especially true of tubercles, whose effects are the more marked as they increase in size, and according to the rapidity of their growth. By the pressure produced in this manner upon the surrounding cerebral parts, a general increase in bulk of the affected hemispheres takes place, and disturbances of the circulation are apt to ensue, which ultimately lead to cerebral œdema or effusion into the ventricles; however, they are apt to occasion softening or small apoplexiæ in their immediate vicinity. The various forms of neoplasms, arranged in the order of their frequency, are—

(a.) *Tubercle.*—The number of large tubercles in the brain is very limited, for usually they occur in twos or threes, and seldom more than five or six. The size varies according to the number, and usually fluctuates between a hazel and walnut. On the other hand, when a large number are found together, they are not apt to exceed the size of a pea. In form they always approximate more the round or oval, very rarely become agglomerated into irregular nodular masses, and, from this fact, it is supposed that tubercles probably embrace a certain space from the beginning, and do not subsequently become enlarged by external accretions. Tubercles have been found in all parts of the brain, still it cannot be denied that they are more frequently located in the gray substance than in the white. Hence, they are found either entirely at the periphery, or deep in the centre, where, as in the corpus striatum and optic thalami, much gray substance exists. It is very rarely met with in the medulla oblongata, or in the septum or crura cerebri. Peripheral tubercles may be situated so superficially that they touch the meninges and adhere to the dura mater, and so be confounded with tubercles of the meninges, which, however, never occur in this manner. If the tubercle itself is examined accurately, it will be found to present no differences from the large cheesy tubercle of the bronchial glands or of the lungs. It consists of a yellow, lardaceous, tough, friable mass, which, under the microscope, exhibits no cell-formation, but only amorphous granules and masses, in short, nothing but detritus. The parts by which they are immediately surrounded are vascular, and the union between them and the cerebral tissue is not very intimate, for they may be entirely enucleated without any particular dexterity or trouble.

The manner in which they originate is by no means clear, since only the fully-formed yellow cerebral tubercle is found, without any gray, crude, semi-transparent granules, such as it is possible to demonstrate in almost every tuberculous lung. It is true that *Rokitansky* has occasionally found some portions of tubercles in this crude, jelly-like state, but he believes that the transformation must progress very rapidly. Usually the whole tubercle forms a homogeneous mass, without any differences in consistence or color; still, occasionally, the commencement of softening may be detected, whereby the liquefied centre, or perhaps even the entire nodule, will represent a capsulated cavity with sanious purulent contents. Microscopically the purulent mass which occurs here is distinguished from genuine pus by the absence of all cell-like structure, and the presence of simple detritus. No cretaceous tubercle is ever found in children, for a period of many years is necessary for the calcification of large tubercular masses. The most common complication, and at the same time most common cause of death, is acute miliary tuberculosis of the meninges, with acute hydrocephalus, which appears to originate through a direct absorption of the primary tubercles. The next complication as to frequency is tuberculosis of the bronchial glands and lungs. The reason why large, yellow, cerebral tubercles are found oftener in children than in adults is, that the adventitious growth, which probably is congenital, or acquired immediately after birth, may remain latent for some time, even for several years, without displaying any well-marked symptoms, though death commonly occurs during childhood, and on this account this pathological condition is but exceptionally seen in the adult. Cerebral tubercles produce no symptoms that are not produced by other neoplasms of the brain, and, in order to avoid repetition, all the symptoms occurring with them will be described at the conclusion of this anatomo-pathological *exposé* of their character.

(b.) *Carcinoma.*—Carcinoma of the brain, like carcinoma in general, is of itself extremely rare in children. I have met with it twice only in infantile cadavers. According to the statements of all authors, the medullary cellular form, "fungus medullaris," is the predominating variety; the hard fibrous cancer scarcely ever occurs. Cerebral carcinoma either infiltrates the brain, gradually disappearing in the normal cerebral substance, or it is sharply defined, of a round or oval form, and in these cases may be entirely enucleated with great ease. Usually it is a mass of considerable dimensions, and exists only in one hemisphere; still, instances are related where nodules of cancer were found scattered throughout the entire brain. They have no preference, as in the case of tubercle, for the gray substance. These carcinomata usually grow very rapidly; they become somewhat flattened when they have reached the vault of the cranium, and may even cause atrophy of the bone, and make their appearance on the scalp; or they may grow along the optic nerves into the orbit and attack the bulbs. They are often primary in the brain, and remain isolated in it without simultaneously occurring in other organs.

(c.) *Entozoa.*—A few solitary cases are reported of encysted worms having been found in the brains of children. Echinococcus has been found in the cerebral substance in the shape of large or small cysts. Cysticercus cellulosa occurs somewhat more frequently, and in most instances is at the same time present in large numbers in the muscles. The cysticercus, according to ***Rokitansky***, is found almost exclusively in the gray substance, and preferably in the peripheral layers of the cerebral portion, where the cysts project above the level of the brain, and partly elevate the meninges. The animals may perish, and the cysts undergo calcareous degeneration, and a cretaceous substance will then be found enclosed in a capsule, and can be distinguished from cretefied tubercles with great difficulty.

Symptoms.—It is one of the most inexplicable phenomena in pathology, that the symptoms of these neoplasms are by no means constant, and still more that, in a great number of cases, none at all are observed. Apparently perfectly healthy children are taken sick with acute hydrocephalus of the usual form, succumb to it in two or three weeks, and the autopsy reveals one or more large yellow tubercles in the brain, which may even be undergoing softening, having existed many months, perhaps years, without producing the slightest symptom indicating their presence. In other cases, a prolonged and distinctly pronounced prodromatory stage is noticed, and the general signs of a chronic cerebral compression supervene. The child loses its appetite, vomits, and is attacked by unilateral or bilateral paralysis. The organs of sense become abolished, amaurosis, deafness, violent headache, convulsions, and contractions of the muscles, come on, and then the symptoms of meningitis usually terminate the sufferer's life. In most of the cases affected with the various kinds of carcinoma, there is intense headache, quickly followed by incessant restlessness, stuttering, weakness of the organs of sense, movements resembling St. Vitus's dance, onanism, convulsions, sleeplessness, paralysis, and exhaustion. In encysted entozoa, epilepsy, and chorea in particular, is frequently observed, and, in addition, the symptoms just described. The diagnosis of probable cysticercus can only be formed when, with the existing cerebral symptoms, the cysts of this entozoa can at the same time be found in the muscles, eye, and other parts of the body. Neoplasms of the brain are beyond the reach of therapeutics. They can, at the utmost, call for a symptomatic treatment only.

(9.) Congenital Malformations.—Besides congenital hydrocephalus and hernia cerebri already spoken of, a few other arrests of development occur, which are of interest to anatomy and to embryology only, as most of them are mere monstrosities.

In this class we find *acephalia*, or brainless and headless monsters. This condition is generally accompanied by spina bifida, ectopia of the heart, absence of the lungs and abdominal viscera, and distorted extremities. There may, however, be only a *deficiency of the brain*, which may exist either in the longitudinal or transverse diameter. Thus hemicephalia may exist of various grades; almost the entire brain may be wanting, from the small remnants of which the cranial nerves originate. The hemispherès may be wanting, with the exception of a small portion at the base. Conjointly with this, the cranial bones are defective, or of a rudimentary formation, and the meninges primarily distended into a bladder containing water, but which, having burst very early, hangs in atrophic folds over the shapeless cerebral masses. Again, only a small portion of the brain may be wanting—the anterior lobes, for example, and olfactory bulbs, the optic thalami and optic nerves, pons Varolii, etc. Along with this, a corresponding malformation of that part of the face destined for the reception of these absent structures exists. The cranial bones in these cases, though small, may yet exist. The most striking of all defects in the longitudinal diameter is the single *cerebrum*, combined with cyclopia, and absence or deformity of the face. Next is a coalescence of the optici thalami and corpora striata; or still again, an absence of the commissures, thus splitting the brain by this condition of the parts. In these cases the formation of the bony case may have taken place normally; but idiocy and bodily defects always exist. Again, the brain, though existing, may be very *small*, but in all other respects perfectly formed; *microcephalia.* This condition occurs independently of that in which partial absence of some part exists. The vertex in these cases is low, the forehead flat, and the entire head pointed. Children so affected are capable of life and development, and, singularly enough, are not tardy in their mental development.

Excessive growth of the brain is extremely rare, and the numerous splittings of the lobes which here and there occur are to be looked upon rather as anomalies of form than excessive formations.

B.—*DISEASES OF THE SPINAL CORD AND MEMBRANES.*

(1.) SPINAL MENINGITIS AND MYELITIS.—The diseases of the spinal marrow are still in a state of obscurity, and all that is positively known of them could be stated in a few lines, if we were only to confine ourselves to the distinctly demonstrative anatomo-pathological alterations. First of all, as regards the much-abused hyperæmia; all *post-mortem* appearances must be excluded as spurious where the cadaver was not placed upon its face immediately after death, and the autopsy was performed later than twenty-four hours after life terminated. Without this precaution there will be found in every case, even in the most normal, extensive *post-mortem* hypostasis, imbibition of the coloring matter of the blood, and putrid softening, by which it becomes totally impossible to establish the previous existence of any actual disease in the medulla spinalis. Although the anatomo-pathological condition is different in kind, still inflammation of the spinal cord and its membranes may be comprised in one group of symptoms, for the phenomena in both processes are almost identical, and hence a differential diagnosis becomes extremely problematical.

Pathological Anatomy.—The sac that is formed by the dura mater does not completely fill out the canal of the spinal column, but is secured there by adipose tissue, which accumulates more toward the vertebral laminæ, anteriorly against the vertebral bodies by loose cellular tissue, and all around by venous plexuses. This sac of the dura mater, on its inner side, is firmly united with the external lamella of the arachnoid; while the internal lamella of the latter hangs loosely, together with the pia mater. Between these external and internal plates or lamellæ, is contained the cerebro-spinal fluid, which mingles with that of the meninges and ventricles of the brain, and even in small children may amount to a drachm. The pia mater of the cord is richer in vessels than that of the brain, and in the new-born child can readily be pulled off. Having thus briefly recapitulated the normal condition of the spinal meninges, we may proceed to the investigation of the character of the hyperæmia and of the hæmorrhage. In young children the cerebral arachnoid and pia mater, and the veins within the spinal canal, are always plethoric; in fact, the vessels are so full that, even when the precaution is taken of turning the body on its face immediately after death, extravasations are not of unfrequent occurrence. These pathological phenomena were first explained by *Weber*, of Kiel. It is not always easy to determine whether the blood found *external* to the dura mater was extravasated during life, or whether the blood was poured out upon the dura mater, from veins that have been severed during the removal of the vertebral laminæ. The best means of guarding against an error is not to attempt the removal of very long sections of the vertebral laminæ at one time, but to remove small portions, at different places, and then allow a feeble stream of water to play upon the exposed dura mater. The blood exuded from the veins after death is entirely washed away in this manner, while that extravasated during life is always somewhat coagulated, and adheres rather firmly to the dura mater. These hæmorrhages are most frequently found in the cervical and lumbar regions, sometimes extending but a short distance, or lining the whole spinal canal, forming a complete sheath of coagulated blood. Small extravasations are sometimes seen more distinctly upon the disarticulated vertebral laminæ than upon the dura mater, and for that reason the inner surface of the former must always be thoroughly examined. The same kind of hæmorrhages which occur externally to the dura mater are also met with in the sac between the dura mater and arachnoid, or the latter and pia mater. Here also the amount of the extravasations varies between a pin's head and such a quantity that the whole cord is surrounded by blood. It is less easy here for one to fall into an error, in supposing that this fluid has originated during the autopsy, because the dura mater has no large veins which might have been severed. Aside from these hæmorrhages which, conjointly with the consideration of inflammation, have been disposed of, as the highest grade of hyperæmia, true exudations also occur upon and beneath the meninges. In the loose cellular tissue between the dura mater and the bony spinal canal some serum is always found, even in the normal condition; it may, however, become considerably augmented, and, like a gelatinous mass, cover large regions of dura mater as well as remain adherent to the inner surface of the disarticulated laminæ. In older children, after injuries to the spine, or in spondylitis, a visible opacity and thickening of this membrane are also found, along with a deposit of a plastic fibrinous character. In all children a moderate quantity of spinal fluid is found on opening into the dura mater, which normally is of a pale-yellow color and perfectly clear, but which, in affections of the arachnoid and pia mater, becomes opaque, flocculent, and bloody. Bloody discolored spinal fluid is especially found in children dying from pyæmia during the prevalence of an epidemic of puerperal fever. The fluid exudations are always found in the most dependent part, according to the position of the body. In rare instances, a fibrinous deposit is found upon the dura mater conjointly with the flocculent cerebro-spinal fluid, which, like the purulent meningitis within the cranium, may become of a purulent nature. Usually the spinal cord itself, in these morbid alterations of its membranes, is softened and eroded, so that it is difficult, in examining the spinal cord of a child, to diagnosticate a softening or sclerosis merely by the resistance which a scalpel meets, for the spinal cord, in general, is so soft that the slightest force will divide it. Where these morbid changes have taken place, there, as a rule, red softening is observed in some part of the cord itself. The most striking lesions of the cord are found in Pott's disease, where an angular curving of the cord has taken place in consequence of a similar curving of the spinal column from destruction of the bodies of the vertebræ. The cord at the angular spot is dense, flattened, and somewhat yellow, or more reddish-colored than elsewhere; sometimes complete solution of continuity is observed.

Symptoms.—In the new-born child, hæmorrhages and inflammations within the spinal canal furnish no characteristic symptoms, for the tonic and clonic spasms then observed occur even more frequently without any demonstrable lesions of the spinal cord. The symptoms belonging to these conditions can be studied to better advantage in children with spina bifida, the sac of which is ruptured, or in a gangrenous condition. Such children are attacked by intermittent spasms of the dorsal muscles, which may be transient, and only of slight degree. Sometimes, however, they take the form of the most violent and protracted opisthotonos. Touching the spinal column in these patients always causes excessive pain, and induces new spasms, and, for this reason, it is well to keep them constantly upon the side. Severe pains are also produced by touching either of the lower extremities before they become paralyzed. Motion aggravates the pain excessively, and induces new spasms. Finally, paralysis of the lower and then of the upper extremities supervenes, occasionally alternating with spasmodic convulsions, and death ensues, after a few days, from trismus and tetanus. In older children, well-pronounced spinal symptoms are distinctly seen in caries of the spinal column, and as sequelæ of scarlet and typhus fever, where complete paralysis of the lower extremities remains. The patients describe very distinctly a sensation as if the limbs were covered with fur, or of ants creeping upon them; the sensibility of the integument is diminished; severe pain, however, is complained of, if much force be applied. Sometimes convulsive twitchings take place, soon followed by total paralysis. The process at first runs a febrile course, i. e., with a frequent pulse, hot skin, noticed most markedly on the back. This fever soon subsides, but the paralysis continues for many months, and perhaps during life. The rarer phenomena noticed in this malady are: disturbances of the sensibility of the skin, difficult deglutition, palpitation of the heart, attacks of dyspnœa, singultus, priapism, etc. In this connection, the paralysis and convulsions are briefly considered, because the symptoms are often found to exist without any demonstrable lesion of the spinal cord, and their practical importance will be considered farther on in a special section. Inflammation of the spinal cord occurs almost always in a sporadic form; still, according to *West*, it has been observed as an epidemic in France, between the years 1842 and 1844, and lately in the hospitals and workshops of Ireland. Although very decided quantities of serous effusions were found between the meninges, still the cord was rarely and but very little altered. The disease ran a very acute course, and terminated fatally in from one to four days. In regard to the differential diagnosis between inflammation of the spinal cord and that of the membranes, a rule has been established that the first runs a chronic course, without any febrile movement, and with a predominating paralysis, while the latter begins with active symptoms; fever and general convulsions and paralysis subsequently become superadded. As has already been observed, both diseases, more or less developed, run their course together, and it is therefore impossible, and, in fact, useless, to seek for differential signs.

Therapeutics.—An antiphlogistic, methodical treatment can be applicable in the rarest instances only, for the reason that the patients are too young, or, if advanced in years, have been so reduced by the preceding affections which are the fruitful cause of disease of the cord, such as spondylarthrocace, and scarlet or typhus fevers, that they do not tolerate an antiphlogistic treatment. In the early stage of the disease, fever and convulsions are best treated by small doses of calomel. An infusion of arnica-leaves may be given when the first violent symptoms have been palliated, but it is not possible to say that any beneficial effect will be derived from it. The paralysis that usually remains offers no very unfavorable prognosis, for, with the increase of bodily strength, improvement, if not complete recovery, may take place. Cold douches to the back, and the administration of strychnine, are important adjuvants; with the last remedy, however, we must never exceed one-eighth, or, at the most, one-sixth of a grain pro die, as otherwise symptoms of sudden poisoning are apt to be induced. The bladder should be constantly looked after, and the catheter used, if its contents are not voided for more than twelve hours.

(2.) SPINA BIFIDA. HYDRORRHACHIA. (*Hiatus Spinalis Congenitus.*)—By hydrorrhachitis is understood a congenital tumor on the vertebral column, generally situated in the sacral portion, and produced by a protrusion of the meninges of the cord through a bony aperture in the spinal canal.

Pathological Anatomy.—Several degrees of this deformity may exist, and are known as follows: The defect may be confined to a portion, or include the whole canal. A total splitting of the vertebral column is only met with in monsters, hemicephalia, etc., and therefore does not come within the domain of clinical investigation; but defective formation of individual vertebræ does not produce a condition incompatible with life, and must be more carefully studied. Here also we have marked gradations in the extent of the malformation. In the mildest grade of the disease the laminæ are imperfectly developed, or, being normal, the spinous processes are not united, and exhibit a *narrow fissure* between them. Again, the spinous processes may be entirely absent, or the bodies of the vertebræ are separated, and *a wide fissure* is seen to extend through the entire thickness of the spinal column. Lastly, in the extreme cases, *the fissures are still wider*, and several of the vertebræ are in a rudimentary state. If the tumor itself be examined, the sac will be found to be continuous with the dura mater and arachnoid membranes of the cord; the integument covering the tumor is of a normal character, or atrophic, and semi-transparent, or it may be absent. In the latter case doubtless it was ruptured *in utero*, or during labor, and is found hanging in loose folds about the fissure. Where the membranes have remained entire, the tumor, during life, is tolerably tense, and fluctuates, while in the cadaver it is collapsed and flabby. Its contents are the liq. cerebro-spinalis. It varies in size from that of one scarcely perceptible to the touch, to that of a tumor the size of a hen's egg; is usually situated in the lumbar region, but may extend throughout the entire column. The cord itself may be normal, or, if the tumor be situated low down in the lumbar region, it may be spread out tuft-like upon the inner wall of the sac.

Symptoms.—These have been pretty well considered objectively. In shape, the tumor is oval or pyriform, sometimes pediculated; the integumentary covering is discolored and red; distinct radiating cicatrices are often observed on the flattened tumor, probably due to laceration of the sac, and subsequent union during fœtal life. By pressure, the tumor becomes somewhat smaller; if a second sac exists, or when it is complicated with a congenital external hydrocephalus, the latter will become more tense. Pressure upon the tumor is extremely painful, and often produces tetanic spasms. In large tumors with atrophic coverings, movements synchronous with the respirations may also be distinguished, the tumor increasing during inspiration, and diminishing during expiration. On examining the margins of the tumor, the fissure in the vertebræ, with its upper and lower angle, and leaf-like dilatation at the centre, will readily be detected. The subjects are mostly born alive, but very rarely live longer than a few days. The tumor often bursts during delivery, sometimes becomes gangrenous without rupturing; the integument rarely retains a normal character, and subsequently becomes thickened. When air enters the tumor, or when the latter becomes gangrenous and bursts, purulent meningitis is apt to supervene, and will quickly terminate fatally. If a small tumor exists, and the integument remains intact, the patients may thrive; but paralysis of the bladder, rectum, and of the lower extremities, is apt to ensue, and result in death. Yet, cases are reported of individuals, thus affected, enjoying comparatively good health for twenty or thirty years. In the higher grades, the disease rarely exists by itself, but is complicated with congenital hydrocephalus, ectopia of the bladder, of the heart, club-feet, etc.

Chaussier has shown, by the statistics of the Maternité, at Paris, that one case of spina bifida occurs in one thousand births.

These tumors are not easily confounded with any other variety of tumor, as the vertebral laminæ may be felt to be ununited in every true case of spina bifida. Rare instances of congenital hernia dorsalis, cysts, adipose and honey-like tumors (Honiggeschwülsten), are reported as curiosities in medical literature, as having been met with upon the spinal column, and calculated to mislead one into regarding them as cases of hydrorrhachis. The extraordinarily rare condition of intrafœtatio, a fœtus within a fœtus, where a large formless tumor with a few bones is found situated upon the sacrum, has naturally no analogy whatever to the condition under consideration.

Therapeutics.—Surgeons have tried countless varieties of methods with the hope of bringing about a diminution of the tumor, and closure of the spinal canal. The almost invariable failure of all surgical procedures is due to the fact that the inner wall of the sac is formed by the spinal arachnoid membrane, and that any injury of this membrane is apt to produce meningitis, which cannot be limited to the sac. The tumor has been repeatedly punctured with exploring trocars and pierced with needles after forming valvular openings in the integument. Lately *Gaupp* presented a boy seven years old, who had a hydrorrhachis the size of a child's head, which he had cured in the first few weeks of infantile life by puncturing it eight times. After the first puncture, the fissure of the vertebræ could be distinctly felt, but the gap rapidly diminished, and finally closure took place in ten weeks. All the parts constituting the vertebræ are now present in this boy, but the spinous processes are somewhat flattened. Excision, with the subsequent use of compression by quills or small wooden rods, has been tried. *Chassaignac* treated these cases by puncture and injecting iodine, as in a hydrocele, and the pediculated variety has been tied off. Finally, constant, steady pressure upon the tumor by a hair pillow has been tried, but, although this method caused great pain and convulsive twitchings, it did not effect a single cure. All experimenters have been obliged to acknowledge that their efforts have failed, nay, still more, that meningitic symptoms, which are always followed by death, came on immediately after the operation. Though the prognosis of hydrorrhachis is at best very unfavorable, most children dying even without operation, still, owing to the rarity of this condition, statistics upon this point are scarce, and it is therefore difficult to determine which of the two courses it is best to pursue.

The most rational treatment, it seems to me, is to protect the sac from all kinds of injury and pressure, by a soft, cup-shaped pad which will only rest upon its margin, and which is secured to the body by elastic straps. If the hydrorrhachis is complicated with congenital hydrocephalus, as is frequently the case, then no other means should be adopted than that just described, for every diminution and compression of the tumor causes tension within the head.

C.—*DISTURBANCES IN THE NERVOUS FUNCTIONS.*

A number of functional diseases of the nervous system are probably only symptomatic of morbid alterations of the brain and spinal cord, if we may judge from the analogy between their individual phenomena and those of diseases whose pathological alterations are known. The corresponding morphological or chemical alterations of the nervous centres, however, have not yet been demonstrated, which is attended with great difficulty on account of the circumstance that most of these nervous diseases terminate favorably, and *post-mortem* evidence, therefore, is rarely attainable. As the demonstration of the cerebral morbid processes has not yet been accomplished, we have no other resource but to assume that the brain and spinal cord are in a normal condition, and to delineate symptomatically the individual phenomena, with their acquired denominations.

(1.) ECLAMPSIA INFANTUM (CONVULSIONS).—Convulsions in children have long been well known, even to the laity, and form an important class in the diseases of children. They are known by many names: tremor of the head, silent tremor, silent wail, shudderings, spasms, and cramps. These all refer to the same disease, and are characterized by general or partial clonic twitchings of the muscles, and generally caused by some other febrile disease. Consciousness is almost or wholly gone, particularly when the convulsions are general. The single attack cannot be distinguished from an epileptic attack, but epilepsy is characterized by its chronic course and unexpected recurrence, and freedom from fever. From chorea, eclampsia is distinguished by the fact that the muscular contractions in the former continue incessantly throughout the day, and even for several weeks before the affection is relieved, and that the general condition is not affected by it. As regards the period of life at which convulsions most frequently occur, childhood, up to the completion of the first dentition, is the most common; still, even older children, who at an earlier age have suffered from eclampsia, are attacked with violent convulsions at the commencement of an acute attack of an exanthema, even of an angina, or from an overloaded stomach. The milder, partial tremors in most instances last for several days, and reoccur frequently, especially in young children, in consequence of disturbed digestion. The general convulsion, to which alone the term eclampsia ought to be restricted, is not a protracted affection, it being either terminated in a single attack, or, after several paroxysms, always at certain intervals.

The following symptoms are those generally seen in children under one year, who are attacked by the milder form: The child sleeps with half-closed eyelids, the ball of the eye is turned upward, and nothing but the white sclerotica can be seen through the palpebral fissure. The muscles of the face, during sleep, are contracted in various manners, whereby it may seem as if the child were smiling (risus sardonicus), or, as some astute nurses say, "The child is playing with the angels." The breathing is rapid and irregular, sometimes superficial, and sometimes again accompanied by deep sighs; the limbs tremble and twitch, the hands are clinched, and the lower extremities, with the toes sprawling, are contracted against the body. From a restless sleep of this kind, the little one now awakes, frightened, with a cry, and manifests its discomfort by kicking, curving and twisting of the whole body. After expelling some intestinal gas, often with stools of green mucus, and very offensive, and sometimes vomiting, rest and general perspiration, as a rule, ensue, but often restlessness remains for some time. This condition may last many days, and recur several times a day at short intervals. Most of the children become feverish, and, owing to defective nutrition and constant muscular action, the face becomes emaciated and pointed. The more serious form, the true eclampsia infantum, manifests itself as follows: Generally the severer symptoms do not come on at the very beginning with the greatest intensity, but are usually preceded by the class of symptoms already detailed, which also vary according to the age of the child. Obedient, good-natured children become wilful, morose, choleric, are apt to be attacked by muscular twitching during sleep, gnash their teeth, and wake up frightened, with an anxious cry. The eyeballs are rolled upward, the lids are not completely closed, the angles of the mouth are contracted into an unpleasant risus sardonicus, and the general state of the system is always somewhat perturbed. The patients are suddenly attacked by the paroxysm, both when asleep and when awake, and it is impossible to distinguish it from an epileptic fit.

They suddenly become completely unconscious; squinting or an unsteady rolling of the eyeballs sometimes comes on, butusually the eyes are fixed and staring. The facial muscles are attacked by the most varying twitchings; sometimes a smile plays over the face, and sometimes again an expression of anger or displeasure, which, conjointly with the exposed teeth, gives the patients an appearance of beastly ferocity. The jaws perform various acts, such as masticating, snapping, etc., accompanied by gnashing of the teeth. Fluids poured into the mouth excite very imperfect acts of deglutition, and the greater part flows out again. By this time the convulsions have involved almost all the muscles of the body. The muscles of the back are in a state of tonic contraction, or are affected with tetanic twitchings; the extremities perform the acts of striking, thrusting, or twisting; the respiration becomes very irregular, and, in consequence of spasm of the glottis, may stop altogether. After a few whistling inspirations, the breathing is suddenly suspended, and death may ensue in a few minutes, if the spasm does not subside. As an effect of the impeded respiration, we may have bleeding from the mucous membrane of the mouth and nose; but the bloody froth that is usually seen between the lips is oftener due to injuries of the tongue or mucous membrane, which frequently occur during the snapping, biting movements of the jaws, or may be produced by the numerous attempts of the relatives to prevent them. The heart contracts very rapidly, but not unrhythmically. The stools and urine frequently pass off involuntarily. The temperature of the skin on the body is normal, on the extremities is apt to be diminished, and, toward the end of the attack, a perspiration usually breaks out. The sensibility of the skin is so completely abolished that the patients cannot be roused to consciousness by any means, not even the most painful irritants, and they often hurt themselves during their convulsive movements.

The entire train of symptoms here presented is hardly ever observed in one attack; some of them may be absent, without making the paroxysm a mild or an incomplete one.

Such an eclamptic fit lasts for only a few seconds, or, at the most, minutes; paroxysms that last longer than this are due to serious organic lesions of the brain, and should be distinguished from eclampsia. A similar condition ensues after the termination of the convulsions as after an epileptic fit. The patients are semi-comatose and exhausted, the fever increases, the eyes become injected, cerebral symptoms supervene, the appetite is gone, and nurslings will not even take the breast.

Formerly, when the antiphlogistic treatment was much more liberally employed in children, a distinction between eclampsia cum hyperæmia and cum anæmia was made, and the therapeutic measures were accordingly distinct. In the former, phlebotomy and subsequently leeches were used; in the latter, these remedies were not employed. Now, when abstractions of blood are not so much in favor, this distinction is of less value; in fact, we have learned that pale, anæmic children are as liable to be attacked by convulsions as robust and plethoric ones.

Theoretically we distinguish, in addition, (1), an *idiopathic*, i. e., an eclampsia issuing directly from the brain; and (2), a *deuteropathic*, i. e., one reflected to the brain from a diseased organ. Practically, this distinction is often impossible, and we remain uncertain, even after a long observation of the case, which kind of eclampsia we have to deal with. The autopsy alone can clear up this obscurity.

Etiology.—(1.) *Idiopathic eclampsia* may be produced by mechanical compression of the head during delivery, by pathologically demonstrable alterations in the brain, particularly tuberculosis, or by nutriments and medicines, as spirituous liquids and narcotics, acting directly upon the brain, and by insolation. Children with a soft occiput are more disposed to convulsions than others, a detailed description of which will follow in the article on rachitis; they may, however, also originate from direct cerebral irritation, for example, from pressure from without. Mental over-exertion is also advanced as a cause, but it is certainly the rarest of all the causes. Violent fright, great anxiety, and vehement outbursts of anger, are perhaps the most probable ones.

(2.) *Deuteropathic* or *sympathetic eclampsia* is by far the most frequent form, and the intestinal canal the source from which reflex convulsions oftenest arise. The intense irritability of the primæ viæ in all ages of life furnishes the greatest opportunities for them. They may even be occasioned in the first few days after birth, by the retention of the meconium, but at this age there may always be a suspicion of a mechanical injury to the head during the act of delivery.

There is also a peculiar, chemical, unexplained cause, namely, the milk of a wet-nurse, who, shortly before, had been subjected to some mental excitement. Instances have been reported of children, previously perfectly healthy, having been attacked, soon after taking such milk, by short but violent convulsions, which terminated in sudden death; and at the autopsy no cause whatever could be found. These cases, however, are so rare, in comparison with the many cases in which such mental excitement on the part of the wet-nurse is not followed by such results, that this supposed cause has been justly doubted. On the other hand, however, those evil effects, produced by an artificial nutrition, from which intestinal catarrh follows, and in the train of which milder and more serious cerebral irritation must sooner or later ensue, cannot be doubted. These have been seen to occur with their greatest intensity at the period of weaning. Such children suffer first from flatulence and colic, afterward are attacked by a diarrhœa of green-colored and fetid stools, and vomiting; they become very restless and feverish, and, finally, convulsions ensue. In other cases the latter are not preceded by diarrhœa, but, on the contrary, by constipation and loss of appetite. In older children, indigestion and the irritation produced by worms merit particular consideration.

An additional cause, and one that deserves to be well attended to, is found in the *eruption of the teeth.* This process is generally complicated with digestive disturbances, and hence these may be regarded as the prime cause of the convulsions. But there occur cases in which the digestion is entirely undisturbed, and the reflex convulsions therefore have to be explained by other causes than the inflammation of the mucous membrane alone. To authorize the opinion that dentition is the cause in any case, the child must be in one of the five periods of dentition. The mouth will then be reddened and hot, the mucus is often secreted in less quantities than in the normal state, one or the other cheek is dark red in color, it is very restless, and bites at every thing that comes near the mouth, even the nipple of the wet-nurse. Eclampsia, originating from dental irritation, belongs to the serious forms, and often leaves behind it partial paralysis and imbecility.

A third principal cause of convulsions is the *breaking out of an acute febrile disease*, particularly an acute exanthema, where the convulsions in children seem to be analogous to the chill of fever in adults. These eclampsiæ are attended by very little danger, are of short duration, and rarely followed by pernicious consequences. This cause may be conjectured with tolerable certainty when eruptive diseases, which the child has not yet experienced, happen to prevail epidemically, and the prodromata of such an exanthema have manifested themselves. If it be measles, there will be cough, sneezing, and lachrymation. If scarlatina, there will be angina, with difficult deglutition. If small-pox, persistent headache, pain in the back, and violent fever. Often, however, no prodromata at all are observed, and only the course of the disease explains the cause of the convulsions. Among the acute diseases to be mentioned, besides the acute exanthemata, are pneumonia, intermittent fever, and fever following injuries and operations and simple anginæ. A male child was once placed under my care who suffered two or three times every year from intense angina, and in the first day of the illness an eclamptic fit invariably took place which was not distinguishable from epilepsy. I finally extirpated both tonsils, and the eclampsia, or, as the afflicted parents supposed, the epilepsy, has not recurred during the last two years.

Finally, cases are also reported, especially by the older writers, of convulsions said to have originated after the rapid healing of *profusely-discharging eruptions.* Some remarks have already been made, when on the treatment of acute hydrocephalus, concerning the connection between the latter and humid eruptions of the head, and it cannot be denied that, in the rapid healing of external suppurations, the internal organs, and consequently the brain, are subject to the danger of becoming inflamed. On the other hand, we must also acknowledge the fact that many hundreds of cases of impetigo disappear rapidly, either spontaneously or by treatment, yet the children remain as well as before.

The *inheritability* plays a certain *rôle* in the etiology of this disease. The parents, as a rule, have suffered from this affection, and the mothers, in particular, are hysterical and repeatedly afflicted with hyperæsthesia. *Bouchut* relates the history of a family of ten persons, all of whom suffered in their youth from convulsions. One girl of this family married, gave birth to ten children, and nine of these suffered from eclampsia.

Course, Termination, and Progress.—Partial muscular contractions, the so-called convulsions (Fraisen), may be protracted for many days during an acute affection, without very greatly augmenting its danger. The genuine eclampsiæ, however, are mostly completed with a single attack, and the very first eclamptic fit may terminate fatally, or the morbid process that caused it may become fully developed on the following day, thus removing the cause for sympathetic convulsions. Those induced by gastric irritation are relieved by vomiting, expulsion of flatulence, or diarrhœal stools; those depending upon toxæmic causes never return after the acute exanthema, scarlatina, roseola, or variola has once broken out.

As has been observed on a former occasion, this kind of convulsions is seldom fatal; nevertheless, it always gives reason for the conjecture that the disease following will be strongly developed and run its course with violent symptoms. In general, the rule may hold good. The younger the child the more critical will be the prognosis.

According to my experience, those convulsions due to dentition and complicated with intestinal affections—excepting those, in fact, depending upon actual cerebral disease, which almost always lead to death—offer the worst prognosis. Such children die either in a fit or are attacked by hydrocephaloid disease and perish. Others live invalids from permanent brain-injury resulting from the convulsive disease. Almost all squinting children, in whom the strabismus cannot be referred directly to a visible defect of the cornea and lens, have suffered from eclampsia in the first years of life. In addition, loss of either one or more of the senses, amaurosis or deafness, imbecility in various degrees, chronic hydrocephalus, and general or partial muscular paralysis, may result from this distressing malady.

Therapeutics.—We must first discriminate between the partial muscular twitchings (the Fraisen) and the general epileptiform convulsions, the true eclampsia infantum. The treatment, moreover, varies according to the age and strength of the child, and it is absolutely necessary to institute a thorough examination in order to get upon the right track as to the cause of the disease. In this examination the physician must not content himself with the assertions of the relatives, but should personally examine the entire body of the child. For, a splinter in the sole of the foot, between the toes, a foreign body in the nostrils, or in the external ear, may also be the exciting cause, the removal of which will rapidly cure the disease.

In the paroxysm itself the physician can very seldom render any material aid, for the reason that by the time he reaches the house the convulsions have almost invariably passed off, and he has to confine his services to imparting comprehensive instructions with the view of preventing the recurrence of the attacks. The first thing to be done is always to undress the child as quickly as possible, so that no constricting bands or skirts may additionally impede the respiration and circulation. Next the child, with the head slightly elevated, is laid upon a large bed, or on the floor, when the convulsions are so violent that there is danger of injury to the extremities against the sides of the bed or of its falling off. That such children are not to be left alone is self-evident. By sprinkling the face and exposed chest with cold water we may succeed in inducing deep, spasmodic inspirations, by which the danger of suffocation at least is lessened. No other striking abortive effect, however, is usually accomplished by this procedure.

Venesection, suggested by some therapeutists in this disease, is, aside from all other objections, inadmissible, for the reason that it is not possible to perform it during the paroxysm, or at least not without uncertainty and danger, for, when a vein has finally been opened, the aperture is immediately closed again by the contraction of the arms and displacement of the wound in the cutis, and the flow of blood must necessarily be arrested. I may mention here the suggestion thrown out by *Grantham*, to constrict the skull in children whose fontanels are not yet ossified, by firmly bandaging it. I have tried this bandaging of the scalp in two cases, but have derived no benefit in either; on the contrary, such an amount of restlessness was produced, when continued for the long time recommended by the aforesaid author, as a prophylactic, that after a few days it had to be abandoned altogether.

As regards the benefit to be derived from remedies after the attacks have passed, we have to look for that mainly in derivatives. Sinapisms, or, in infants, leaven is applied to the calves of the legs, or these parts are rubbed with mustard spiritus, by which intense redness is almost instantaneously produced. When there is the least suspicion of the existence of gastric irritation, a derivative from the intestinal canal should also be administered. This should only be omitted in children who before and during the fits had had diarrhœa, and had expelled large quantities of flatus. To older children, who shortly before the paroxysm had taken a considerable amount of nutriment, it is best to give a proper emetic of, for example, ***tart. stibiat.*** **gr. i.**, dissolved in a strong infusion of ipecacuanha, by which the entire contents of the stomach are soon evacuated. But, where no probable overfeeding, or indigestion, can be ascertained to exist, calomel is to be preferred to the emetic; half of or one grain of calomel is to be given to the child every hour, until a few evacuations have been produced. When constipation is the presumable cause of the eclampsia, a clyster may be administered, even during the convulsions. I have never been compelled to resort to croton-oil in this affection.

Of all the antispasmodics, oxide of zinc, in one to two grains pro die, is the most useful, and best adapted for a prolonged use. It is rather difficult to form an opinion as to the benefit derived from such prophylactics, for the reason that in most cases but one eclamptic fit occurs. Narcotics are not admissible in this disease, because they do not act quickly enough, when administered during the fit, to arrest it, and afterward are apt to induce cerebral congestion.

An after-treatment, by the use of tonics, iron, quinine, and ale, may be indicated, chiefly after eclampsiæ consequent upon gastric and dental irritation.

(2.) PARALYSIS.—Since central paralysis, produced by diseases of the brain and spinal cord, has already been mentioned in connection with those affections, we still have to speak of what has been called *essential* paralysis of one or more extremities, coexisting with perfect integrity of the nervous centres, and also of the peripheral paralysis of the *facial nerve*.

As regards *facial paralysis*, it is sometimes observed immediately after birth, but, on account of the immobility of the features, it is much more difficult to recognize in the new-born child than in the adult. The lesion does not become noticeable till the child begins to cry; the angle of the mouth on the sound side is then seen to be drawn outward, and the whole healthy moiety of the face is generally thrown into folds, while the paralyzed half remains as immovable as before. When the cause of the paralysis is central, the uvula will also be seen to stand obliquely; in most instances, however, no alteration whatever can be observed on the palate and uvula, as the cause of the paralysis usually lies in the course of the facial nerve. The most frequent cause of the paralysis of the new-born child is to be found in the use of the forceps. In addition to this, it may also be due to a congenital smallness or distortion of the petrous portion of the temporal bone, which occasionally occurs. Later in life, caries of this bone, glandular indurations, and contracting cicatrices in the vicinity of the facial nerve, are the most common causes.

The *treatment* of facial paralysis depends upon its cause, and is effectual only when that is capable of removal. Contracted cicatrices, most frequently the result of scrofulous ulcers, and glandular tumors, may be removed by an operation; on the other hand, paralysis, the effects of caries of the petrous portion of the temporal bone, as a rule, is irremediable.

Essential paralysis of single extremities, very briefly alluded to in the older text-books, is a much more frequent and interesting affection, and has lately been more accurately described by *Heine*, *Kennedy*, and *Rilliet.*

By *essential paralysis* is understood a partial or complete loss of power of motion, and of sensibility in one or more extremities, without any discoverable evidence of its depending upon lesions of the nervous centres. That the central organs have experienced none, at least no material alteration, may be readily concluded from the facts that the paralysis sometimes disappears very quickly, after two or three days, and from the reports on autopsies of children with essential paralysis who had succumbed to other acute affections. *Rilliet* and *Barthez* have had two opportunities to dissect such bodies, and *Fliess* has had one. The former found no alteration whatever in the brain and spinal cord; the latter, in a case of paralysis of one arm, found a simple congestion of the meninges of the cord on a level with the brachial plexus. *Post-mortem* examinations of essential paralysis are always very rare occurrences, because this disease *per se* is not apt to terminate fatally.

Symptoms.—Paralysis, usually, in most instances, begins in this manner: The child, during dentition, but otherwise in good health, falls asleep at the usual time in the evening, is somewhat restless during the night, and, on the following morning, awakes with one arm or leg, seldom both legs, paralyzed. The palsy is complete on the very first day of its occurrence. In other instances, difficulties of dentition, with convulsions, or even eclamptic fits, precede it for several days. The palsies which follow these phenomena are mostly hemiplegic or paraplegic, and are of longer duration than those which originate in a simple manner. In exceptional cases, essential paralysis of the lower extremities follows chorea, typhus fever, and the acute exanthemata. In these latter cases it develops itself most markedly during convalescence. It is very questionable whether it is really always primarily peripheral, and originates without any morbid alterations of the meninges. That paralysis which affects one extremity, most frequently the upper, and which comes on suddenly during the night, and without the least disturbance of the general system, presents the simplest form of essential paralysis under discussion, and to it we will now call attention.

Although the whole group of symptoms must be regarded as complete from the very beginning of the disease, still, two stages may be distinguished in its course: (1), the stadium of simple paralysis; and (2), that of atrophy.

The second stage, when the disease runs an acute course, and soon passes into recovery, does not take place at all; it only occurs in cases that have lasted for some months. In the first stage, no alteration can be discovered in the length, circumference, or temperature of the affected limb, but, when the malady is longer in duration, the limb begins to waste, the muscles become flabby and thin, the adipose tissues also decrease, and, lastly, even the longitudinal growth of the bone is more or less arrested.

As regards the symptoms of the individual palsies, those of the arm manifest themselves in the following manner: The arm hangs powerless by the side. It is a remarkable fact that paralysis of the muscles of the arm occasionally occurs, without involving the muscles of the hand and fingers of the same limb. The reverse of this condition has never, to my knowledge, been observed. In this case the patients are still able to grasp with the hand, but are unable to lift the grasped object. For example, they can grasp the spoon, but cannot carry it to the mouth. Older children try hard to use the affected limb, and assist it with the sound one. The only alteration of form that is noticeable from the very commencement is, a flattening of the outer contour of the shoulder, caused by a paralysis of the deltoid muscle, and the weight of the dependent arm itself.

Essential paralysis of a lower extremity seldom implicates all the muscles of the limb; it often affects only those of the leg, and not always all of these. The foot is inclined either inward or outward, according to the muscles affected. The disease is very easily recognized. In children not yet able to stand, the palsied limb lies quietly during their crying and struggling, while the other is drawn up against the body, and, when seated upon a chair, the paralyzed limb dangles about lifelessly. In children who have walked, the signs are still more marked. They make no further attempts to walk, or, if it be a partial paralysis—that is, of only certain of the muscles—will drag the leg after them, or hop on one foot.

When both lower extremities are affected, the child will lie motionless in bed. It, however, soon learns to sit, aided, perhaps, by returning functional ability of the limbs, which progresses from above downward, so that it is first able to move the thigh, next the leg, and finally the foot.

The peculiarity of this peripheral paralysis is, that neither the bladder nor the rectum ever becomes affected by it.

Its course and duration are variable. In most cases, the palsy disappears completely after a few weeks or months, without leaving any effects behind, but, when it lasts longer than six to eight weeks, without any improvement having taken place, the signs of commencing atrophy, so far as concerns the alterations of form, will ensue. A marked decrease in the temperature of the skin soon becomes superadded, followed by complete anæsthesia, and frequently, also, by slight œdema of the dorsum of the feet, the chief cause of which is, undoubtedly, the feeble circulation of the affected limb.

The atrophy never proceeds so far as that it is not still possible, by faradization, to produce contractions of the single muscles. The sensibility in the paralyzed limb is continued for a much longer time, but whether it is as perfect as in the sound limb is not easy to decide, for the children are mostly still too young to be able to make very fine discriminations. During the first few days after the invasion of the palsy, hyperæsthesia and decided painfulness are sometimes observed, seemingly due to inflammation of the neurolemmata; still, they may also be suspected to be caused by preceding contusion, or they may be feigned. After several days, these pains disappear.

The longer the palsy exists, the greater the alterations of form become. The shoulder-joint becomes enfeebled to such a degree that a dislocation of the upper arm may take place. A depression appears beneath the acromion process, and the deltoid muscles become completely flattened. In partial paralysis of the lower extremities, contractions in the direction of the sound muscles occur, producing club-feet and genu valgum on the lower extremities, and scoliosis of the spinal column, in consequence of obliquity of the pelvis.

In regard to the duration of this disease, *Rilliet* and *Barthez* have furnished us with more accurate statements. In one case, a well-marked essential paralysis disappeared in twelve hours; in many others, in from six to eight days. Complete recovery has been seen to take place after a duration of eleven months. Even when the affected extremity exhibits imperfect development, and is able to perform but few and feeble movements, it is still possible, even after the lapse of years, by proper gymnastics, and by the use of electricity, to improve its condition, and, perhaps, to cure the disability.

Etiology.—Essential paralysis is a disease of early childhood, and is most decidedly connected with the eruption of the teeth. Children under half a year are but seldom affected with it; most frequently it comes on at the eruption of the molar teeth, and becomes extremely rare after the completion of dentition. No age of life, however, is exempt from it. More boys than girls, according to my experience, are afflicted with it. This, however, may also be accidental, for, in the more recent text-books, this disproportion is not alluded to.

The state of the constitution seems to possess no influence in this disease, for most of the children attacked by paralysis have enjoyed good health, and have flourished well up to the time of the attack. While scrofulous children are sometimes its victims, there is, nevertheless, no conclusive evidence that the very common scrofulous cachexia furnishes any special predisposition to the disease. The only tolerably constant occurrence in it is congestion of the brain, and disposition to constipation during dentition. In some of the more recent works it is stated, with especial emphasis, that exposure to cold is the most frequent exciting cause; but a single case, however, is cited, in support of this statement, namely, that of a child which sat upon a cold stone, and thereupon contracted a paralysis of one of the lower extremities. The many hundred other children, especially those belonging to the lower classes, who habitually sit upon cold stones, and yet escape the disease, furnish evidence which weakens this theory as to the exciting cause of the disease.

Therapeutics.—The antiphlogistic treatment, local abstraction of blood, calomel, etc., has, as in almost all diseases, also been employed in this paralysis, but without better results than those obtained from the expectant treatment. The same may be said of purgatives, and, in fact, of all the other remedies recommended in its treatment. Many of these have been enthusiastically praised, because most essential paralyses disappear after one or several weeks, whatever agents have been employed. But, as to a specific effect of the remedies recommended, it is futile to speak, for there are many cases of essential paralysis, as to the diagnosis of which there is no doubt whatever, and yet resist all methods of treatment, even that with electricity.

The most rational and the *simplest* treatment for the first few weeks of the paralysis seems to be the daily employment of the cold douche, afterward wrapping up of the limb warmly, passive motion, and spirituous frictions. Most essential paralyses are easily cured by these means. If, after four weeks, no improvement is effected, then it is time to obviate, by induced electricity, applied daily for ten minutes, the consecutive atrophy of the muscles.

If, after several weeks more, no improvement is realized, the internal use of sulphate of strychnia, $\frac{1}{16}$ to $\frac{1}{6}$ gr. pro die, may be resorted to. This preparation is much preferable to nux vomica, on account of the variable quantity of strychnine the latter contains. The utmost caution should be employed in the use of this remedy; the relatives should be informed of its toxic action, and precautionary measures should be adopted in case sudden violent tetanic attacks happen to come on. The best means for this purpose is to dash some cold water on the body, and to administer strong coffee.

Deformed extremities must be restored to their normal shape by orthopædic treatment, and, for the incurable paralysis, mechanical orthopædia, with its numerous ingenious apparatus, may likewise be advantageously resorted to.

(3.) CHOREA MINOR. THE LITTLE OR ENGLISH ST. VITUS'S DANCE, MUSCULAR JACTITATION. INVOLUNTARY MOVEMENTS OF THE MUSCLES. BALLISMUS, SCELOTYRBE.—The best description of the little St. Vitus's dance is given by *Hasse*, in his Diseases of the Nervous System, in *Virchow's* Pathology and Therapeutics, and which also forms the basis of the following characteristic description.

By *chorea minor* we understand a constant involuntary movement of almost all the voluntary muscles, which increases in severity when the movements are being directed by the will, and ceases only with the total abolition of consciousness; for example, in sleep. This definition sufficiently distinguishes St. Vitus's dance from the other conditions which were formerly spoken of in connection with it, such as the great St. Vitus's dance, the dancing mania, the imitatory popular diseases, and the tarantula disease.

Symptoms.—The constant involuntary jactitations are seen either in all the voluntary muscles of the body or in some portions only. They may be seen in the upper moiety of the body, or confined to one side; in one arm, and the corresponding leg, giving rise to the dance-like movements in those limbs. In very rare instances one arm and the opposite leg are affected by this muscular restlessness. Nor are all the extremities always implicated in a uniform manner, for, while one arm is not at rest for a single moment, twitching incessantly, the other may be at rest for several minutes, and, indeed, only be affected by slight, barely-perceptible muscular tremors. The same inequality of the affection is also observed in the lower extremities. The muscles of the face may possibly be wholly spared, while those of the lower extremities are in an incessant state of jactitation.

Now, as regards the single twitchings, those on the upper extremities, as a rule, are the most noticeable. The most peculiar distortions and tremors are observed in the arms; the shoulders are drawn high upward, as if the patient were trying to scratch himself; the fingers are sometimes closed, and then again extended, or they are incessantly employed in pulling at the garments. The feet are not at rest for a single instant, and an incessant stamping is produced by the different involuntary contractions. When the patient lies down, the toes spread out, and contractions also take place at the knee-joint. The gait becomes unsteady and uncertain, and, in extreme cases of the affection, walking becomes altogether impossible. When one limb is more severely affected than the other, it produces limping. The most singular movements take place about the head. It is twisted, shaken, sometimes spasmodically drawn to one side, and then again to the other. The contractions of the facial muscles produce the most wonderful contortions, which may even degenerate into the severest caricature-like grimaces. The eyes glare, or temporary strabismus comes on, and the eyelids usually blink incessantly.

The muscles of mastication and deglutition also become affected by the restlessness, and during mastication the patients bite the tongue or mucous membrane of the cheek. Even gnashing of the teeth, when the mouth is empty, occurs. Deglutition is not always performed according to the will, nor are the movements of the tongue. Hence these children stutter, stop in a middle of a sentence, and often bite their tongue in the attempt to speak. The body is turned about and twisted in every direction. The respiratory muscles, however, do not noticeably participate in the jactitation, at least the inspirations are not executed irregularly.

The immediate effect of this condition is of course a constant interference with the voluntary movements, which react and cause a visible aggravation of the convulsive affection. The patients are unable to eat properly, are attacked by twitchings while in the act of carrying the food to the mouth, they bespatter themself with fluids, and prick themselves in the face, if imprudently a fork has been allowed them. While in the act of writing, they will suddenly make long hooks, and crooks in the letters, or thrust the pen so violently upward as to pierce through several pages of the copy-book. When they attempt to undress themselves, such violent tremors result, in consequence of the greater voluntary movements necessary for that purpose, that the clothes are torn. When they are commanded to stand quietly, the very effort to comply only renders the stamping still greater. If ordered to protrude the tongue, that organ will be rolled out of the mouth with the most peculiar shiftings and twistings, and can in no case be kept quietly protruded for any length of time.

When an attempt is made to hold the affected part firmly, the restlessness becomes still more aggravated than when a voluntary movement is undertaken. A permanent aggravation of the whole affection may even be produced thereby.

The sensibility of the skin is not diminished in chorea, and the ordinary reflex movements may be induced by the various cutaneous stimuli, such as pricking, burning, etc. Also sneezing and gaping are executed without any hinderance, nor does the disease seem to exercise the least influence upon the evacuation of the bowels or bladder. It is worthy of remark, and a curious fact, that these children, even in the severest cases, where they are the whole day through in a constant state of agitation, never complain of fatigue, the contractions being as severe in the evening; often, indeed, they even become stronger. No constant signs of any disease in the nervous centres can be detected in this affection. Nor has the symptom advanced by *Siebel*, of pressure along the vertebral column almost always producing pain, been confirmed by other observers.

The disposition of the mind in choreic patients often undergoes a change. They are much inclined to weep, and become choleric; previously well-disposed and kind children become petulant and malicious. If the disease is protracted for a long time, the memory will also become somewhat impaired. Numerous and noticeable as the symptoms are when the child is awake, in sleep they almost disappear. In the evening when the patients become tired and lie down, the jactitations gradually subside, and cease completely as soon as consciousness is gone. The sleep is usually less tranquil than in healthy children, and even some slight choreic movements are made during dreams, but, with the awaking, all the symptoms come on again with their former severity.

Chorea is not attended by fever, and runs its course without any visible disturbances of the general system; on the contrary, it has even been observed that the muscular twitchings became markedly feebler during the course of an intercurrent acute affection, for instance, an acute exanthema, and, in that case, are quickly followed by a permanent improvement, and a complete recovery. The pulse, in simple chorea, is neither irregular nor accelerated; the contradictory statements of some authors are probably due to the difficulty of securing the radial artery, owing to the constant jerking of the tendons. But, if the heart is carefully auscultated, it will be conclusively seen that the rhythm and frequency of the cardiac contractions are always normal.

When the disease lasts for some time, the nutrition will now and then suffer materially, the children become pale and lean, and, in older girls particularly, anæmic cardiac murmurs and chlorotic symptoms generally manifest themselves.

Its course is always chronic, and a tolerably well-developed chorea is scarcely ever cured in less than two or three months, others last half, and even a whole year; indeed, *Romberg* relates the case of an old woman seventy-six years of age, who suffered from chorea seventy years, was still living, and would undoubtedly take it with her to her grave.

Chorea has also been divided into stages, such as (1), the stadium of premonition; (2), of aggravation; (3), of the climax; and (4), of subsidence. But divisions into stages, in diseases where the transitions are so gradual, and are not ushered in by any marked symptoms, have but little value. The invasion of the disease is gradual in all cases. The subjects noticeably become awkward, drop every thing, break almost every thing that is given them, often stumble, and become anxious and intimidated in consequence of the injuries which they suffer as the result. Generally, the first involuntary movements take place after some mental excitement, such as fright, fear, anger, etc. At first they are seen in some small groups of muscles, but subsequently, and more or less rapidly, become general, so that in two or three weeks the disease has attained its climax. From that time the symptoms remain stationary for at least four to six weeks, without undergoing any exacerbation or amelioration. Finally, an almost imperceptible improvement ensues. Relapses, however, are of frequent occurrence. *See* observed them thirty-seven times in one hundred and fifty-eight cases. In the end, however, a complete recovery generally takes place. An exceptional case may sometimes occur, in which a twitching of individual groups of muscles, especially of the face, remains for years, or through life. *Wicke* and *Leudet* also describe some fatal attacks. The disease, in those cases, rapidly assumed a form of the utmost gravity, coma came on, attended by the involuntary passage of the stools and urine, soon followed by collapse, irregular respirations, small pulse, and death.

Etiology.—Chorea is almost exclusively a disease of childhood, and, when adults suffer from it, it will be found that they acquired it during their youth. Most frequently it attacks children between the sixth and sixteenth years, owing to which, its origin has sometimes been sought for in the second dentition, and then again in the prospective puberty. Although these processes may also furnish a disposition to chorea, still their connection with it is not a very intimate one, for, it very frequently disappears without a molar tooth having been cut through, or menstruation having made its appearance.

Chorea is one of the few diseases which attack the sexes in unequal numbers. According to a compilation by *Duffossé*, seventy-nine out of two hundred and fifty patients were males, and one hundred and sixty-one females, and *See* maintains that the ratio of cases of the disease among boys, as compared with girls, is as one-third to two-thirds. Here, in Munich, this disproportion seems to be still greater, for, among eleven chorea patients which I noted in my diary, I find only one boy affected.

No special inheritance exists here, and it happens only exceptionally that the child, of a mother affected during her youth with chorea, is attacked by it. On the other hand, however, the fact is not to be ignored, that most of the mothers of such children have an irritable nervous disposition, and suffer from the most varying forms of hysteria. Preceding febrile diseases likewise predispose one to chorea.

No distinct influence of the season of the year can be perceived in this country, while chorea very seldom occurs in the tropics; in the northern latitudes, on the contrary, it is said to be more frequent. Whether it may also be epidemic, as is claimed by some of the investigators of medical history, is still not satisfactorily established. Those so-called epidemics are probably referable to simple imitation. That chorea may originate in girls' boarding-schools, as the result of mimicry, is vouched for by many reliable observers, and instances of that nature have recently occurred in a Tyrolean village, and in a *pensionnat* at Eisenach.

We find an analogy for this circumstance in the origin of hysteric spasms, by merely seeing a person suffering from such convulsions, as is often observed in the female sections of large hospitals.

Fright, in particular, is often accused of being a psychical cause. It may, no doubt, hasten the outbreak of chorea in a child commencing to suffer from it; but if fright is really capable of producing it in one who is healthy in all other respects, then we ought to have many more choreic patients, for there are many timid children who, by the slightest cause, are greatly frightened.

See lays great stress upon the connection between chorea and rheumatism, discovered by himself. This connection, however, seems to be a very loose one indeed; for, although it must be acknowledged that chorea may succeed to acute rheumatism, still the frequency of the occurrence has been very much over-estimated. In cities where much rheumatic sickness occurs, chorea ought to abound, and *vice versa*, but it is not so. In Genf, for example, according to *Rilliet's* statement, there is a great deal of rheumatism and hardly any St. Vitus's dance. Moreover, if there were any actual connection between them, then more girls than boys ought to suffer from rheumatism; for it is well known that the former are predominantly subject to chorea. Just the reverse happens to be the case in rheumatism, which notoriously attacks more boys than girls.

Pathological anatomy furnishes totally negative results in this disease, which may, in part, be due to the rarity of fatal attacks. *Froriep* found the odontoid process of the axis thickened in two cases, and describes it as a simple hypertrophy of its osseous substance. They are, on the whole, too solitary instances for any definite conclusions to be drawn from them. In fact, the true cause of chorea has not yet been fathomed, notwithstanding the numerous theories advanced by *Siebel*, sen. and jun.; also the connection with worms, upon which great stress was formerly laid, in reality does not exist, for otherwise chorea would probably be more frequent in worm regions, and be cured by anthelmintics, which, however, is not the case.

Diagnosis and Prognosis.—The disease is usually so easily recognized, that even every layman who has once seen it knows it again at a glance. It distinguishes itself by the uninterrupted and protracted duration of the symptoms, which last for many weeks, from all other convulsions that have been embraced under the not very appropriate denomination of chorea-like affections. To the latter belong stuttering, blinking, contractions of the angles of the mouth, the so-called weaver's and writer's cramp, over which, collectively, the will has some, although very little, influence. Besides, these affections occur only paroxysmally, or at the most diurnally, and are by no means as continuous as chorea. The disease described by *Dubini* under the inappropriate name of *chorea electrica* may be easily distinguished from chorea by the fact that, in this condition, according to *Hasse*, there are headache and pains in the back, followed by electric twitchings of the lower extremities, at first confined to one side, but soon extending over the whole body; general convulsions, with perspirations and fever, now supervene, and the patient dies paralytic in a few weeks.

The prognosis in the great majority of cases may be set down as favorable, and that in three, or at the most six months, most of the children under a treatment that is at all rational will recover completely. That kind of chorea which, according to some authors, runs into epilepsy and imbecility, depends, in fact, upon organic disease of the nervous centres, and consequently ought not to be classed with pure St. Vitus's dance.

Relapses are not of rare occurrence; I have had two children placed under my care, who had completely recovered, were entirely free from muscular twitchings for several months, and were again attacked by a tedious chorea. A most decided disposition to neuralgia of all kinds remained behind in these children. It is a remarkable fact that the cure in boys, according to statistical compilations, takes place much slower than in girls; in the former the treatment lasting seventy-four to eighty-one days, in the latter only thirty-three to thirty-seven days. The latter averages seems to me to have been put rather too low.

Therapeutics.—The main reason why a treatment directed to the cause can hardly ever be practised is, because the true cause of the disease has not yet been fathomed, as has already been shown. In this respect we should pay attention to the condition of the patient's residence, to the evacuation of worms, onanism, menstruation, and rheumatic complications.

Its treatment, with the countless number of remedies that have been recommended, can only, then, be properly appreciated when we bear in mind the spontaneous recovery from chorea. Indeed, a cure is often accomplished in a few weeks, or, at the most, months, with almost any remedy, however absurd, but not intensely toxic. This superabundance of remedies is only found in two classes of diseases and which are diametrically opposite in their terminations, namely, in those which recover spontaneously, and in those that are almost certainly incurable. Epilepsy may be taken as a prototype of the latter.

Abstractions of blood were considered appropriate when the disease occurred with vascular excitement in robust subjects, and *Sydenham* was brought forward as an authority for this practice. It seems to me, however, that every antiphlogistic measure is totally useless, if not actually injurious, for the vascular excitement alluded to is not in the least critical; and an anæmic condition, when the disease lasts for a long time, supervenes spontaneously, which condition is only accelerated by the previous abstractions of blood. Counter-irritants applied to the nape and spinal column, among which ointments of tartar emetic and sublimat., vesicants, and croton-oil, hold a high place, are useless tortures, and leave upon the poor patients permanently disfiguring cicatrices, which may, in future years, mar their attractions and mortify their pride.

Derivatives applied to the intestinal canal are less objectionable, and the most appropriate remedies are the neutral salts, castor-oil, rhubarb, senna, and aloes, and, when the presence of intestinal worms is suspected, they may advantageously be combined with vermifuge remedies. Calomel and tartar emetic, on account of their subsequent constitutional effects, should be avoided, whether in large or small doses, for it is certain that they exercise no marked influence upon chorea.

When vascular turgescence is absent from the very beginning, empirical remedies may be resorted to at once. Among these, iron is, to say the least, the most rational, especially when the child is anæmic, and suffers from incipient chlorosis. The preparations of iron, and mineral waters containing iron, are recommended by the most experienced physicians as useful, and may be given for many weeks without detriment, even after the muscular jactitations have subsided. Serious constipation, resulting from this practice, should be relieved by the above-named aperients. So far as the effect of the remedy upon the nervous system is concerned, it is almost immaterial which preparation is selected; this may be decided on the grounds of its digestibility, and the ease with which it is taken. Children, especially young ones, are not good at swallowing pills; although they will swallow large numbers of cherry-pits with the greatest readiness. They bite pills, and retain the pieces in the mouth till they become soft, and their disgusting taste renders the object sought, viz., the introducing of remedies in a tasteless form into the stomach, unattainable. The administration of powders is, in the long run, inconvenient, as they have often to be frequently repeated at the apothecary's, on account of their deliquescent character. I, therefore, prefer the tincture of iron, and almost always use the ext. ferri pomati, which seems to be most easily assimilated. *Romberg* recommends ferrum cyanatum; others the sulphate and carbonate of iron. According to my experience, large doses of iron do not act more favorably upon the course of chorea than small ones; besides, they are more apt to cause disturbances of digestion and constipation, and, for this reason, I do not consider it advisable to go beyond twenty to thirty drops pro die. During convalescence, quinine, cinchona, and other tonics, may also be given with advantage.

There are, in addition, a number of empirical remedies, which are more highly praised than brilliantly curative. The first to be mentioned here are the metallic remedies, zinc, copper, and arsenic; and, of all the zinc preparations, the oxide is mostly preferred, given up to sixteen grains, three times daily; next, sulphate of zinc, in one to eight grain doses; cyanide of zinc, daily, up to three grains; and, lastly, ferrocyanide of zinc. *Escolar* praises valerianate of zinc, in two to twelve grains pro die.

Sulphate and ammoniate of copper have been justly abandoned, on account of their nauseating action. The same should be done with Fowler's solution, an article which *Henoch* has recently so strongly recommended.

It seemed quite pertinent to try narcotics in chorea, and various experiments have been made with them. Opium, belladonna, haschish, hyoscyamus, hydrocyanic acid, aconitine, and atropine, have been discarded long ago; so, too, strychnine, first suggested by *Trousseau*—who has been most unfortunate with his therapeutic discoveries—has been abandoned by all rational physicians.

In very severe chorea, where the children are unable to obtain any rest at night, temporary palliation may be derived from chloroform. But, when too often repeated, these inhalations affect the head unpleasantly, and disturb the digestion.

Animal and vegetable nervines have been quite as generally employed as narcotics; valerian, assafœtida, camphor, moschus, castoreum, colchicum, etc. Cold baths and douches are of decided benefit, and, as they are mostly disagreeable to the children, exert a good influence by inducing them to use every possible voluntary effort to avoid the necessity of their application. Under this influence, they may resist the involuntary movements to some extent. *Dupuytren* is an enthusiastic advocate of cold baths and douches, and holds that, with their persistent use, every case of chorea is curable, in which declaration, however, he may possibly go too far.

Of late, warm baths, and warm sulphur-baths in particular, have come into use, as many girls are unable to bear cold baths. For this purpose, four ounces of sulphate of lime are added to every bath, in which the children are allowed to sit for an hour every day. *Rufz* is of the opinion that, by this measure, the disease is shortened to twenty-four days; *Köhler*, however, observes, in this connection, that there are also cases where the disease becomes aggravated by it, and prohibits the further use of the sulphur-bath.

As regards the psychical treatment of chorea, more harm than good is often done by harshness and severity; but by this we do not intend to say that the stimulation of the volition should be entirely abandoned. By kindness and promises of presents, the children should be urged to keep quiet until ten or twenty are counted; they should be induced to make simple and easy efforts to control the movements of the hands and feet, and, when successful, should be praised, etc.

Formerly, it was considered injurious to hold children firmly, or to tie them or bandage them in splints; lately, however, cases have been reported where the application of the splints—at first at night only, where the children, on account of the severity of the chorea, were unable to obtain any rest; subsequently, also, by day and night, continued for many days—produced a remarkable improvement, and ultimately led to a cure (*Monahan*, of Dublin). It certainly will only be necessary, in this treatment, to fix gently the extremities, by properly bent and padded splints, while it will seldom be possible to restrain the motions of the body. This method, at any rate, deserves a further trial.

The little voluntary exercises, recommended above, have been more systematically developed by the Swedish-movement cure, by first practising passive, then the so-called duplicate, and, finally, active complicated movements.

The dietetic treatment is of little importance. The irregularly and badly-fed children of the poor recover as rapidly as those of the wealthy class, where every morsel of bread and meat is first subjected to the physician's examination before it is given to the patient. A healthy, dry residence, and the enjoyment of fresh air, accelerate the cure; mental exertions retard it, and those addicted to onanism it is often entirely impossible to cure.

If we make a *résumé* of the entire treatment, we shall find it to consist essentially of cold baths and douches, of the administration of iron, and prudent psychical strengthening of the will. In the severest form, chloroform is to be preferred to narcotics, and a trial with splints would also be rational.

(4.) CHOREA MAJOR (the Great St. Vitus's Dance)—CHOREA GERMANORUM.—A very rare affection, in which term spasmodic diseases of various kinds are included. Chorea major attacks girls almost exclusively, and only those who are approaching puberty. The essential character of this disease consists in this, viz.: the children are attacked by paroxysms of regulated movements, apparently executed with consciousness and proper will, in which a peculiar potency of the mental abilities manifests itself. The transition into somnambulism, animal magnetism, miraculous mania, etc., is very apt to happen, and it requires the utmost professional sagacity to strike the exact boundaries between imposition, or deception, and an actual pathological state.

Symptoms.—The phenomena vary so much in individual patients that it is difficult to sketch a picture of symptoms applicable to all cases. The outbreak of the paroxysm is almost always preceded by psychical and corporeal premonitions. To the first belong sadness, great moodiness, depression of spirits, fear of phantoms, active dreams, and restless sleep; to the latter, palpitation of the heart, cardialgia, disturbances of digestion, anorexia, headache, and pain in the back, may be added.

Finally, actual paroxysms develop themselves. The patients begin to make apparently voluntary, sometimes simple, sometimes again complicated movements, which they execute with unnatural strength, steadiness, rapidity, and perseverance. The patients are seen to perform the movements of swimming, climbing, jumping, dancing, crawling, and attempting the most wonderful contortions of the body.

In others, again, it approximates more to pure psychical alienation or exaltation; they begin to declaim, compose, preach, and sing with great volubility, or to talk nonsense with lofty pathos, or to imitate the cries of beasts.

The influence of the will is not always completely abolished; some cannot be roused from the paroxysm by any means, not even by inflicting any amount of pain, while others, again, are recalled to consciousness by simply dashing water in the face.

This condition most resembles the incomplete narcotism from chloroform, in which the patients are in an unusual state of excitement. Sometimes these paroxysms last only a few minutes; then, again, several hours; and end either by the patients becoming more calm, or then waking up as from a dream, and looking about in surprise, or by relapsing into a profound sleep, often lasting several hours. The recollection which the patient has of what transpires during these paroxysms is variable. Some recollect about as much of what was said and happened in the paroxysm as is remembered of a dream, or they retain nothing at all of it in the memory.

During the attack, external irritation induces no reflex movements, or but very slight ones, a fact which will always give rise to a suspicion that it is feigned. When, for instance, a girl tolerates pinching, pricking, and blows, without flinching, but sneezes when her nostrils are tickled, shivers for an instant when cold water is poured upon her, and when burned arouses, complains of pain, there is usually no actual disease at the bottom, but only a mental derangement, by means of which the nervous child is seeking to excite sympathy.

Here, again, the course of the entire complaint is very variable. Every thing may be completed with a single paroxysm, or several may follow each other at greater or lesser intervals, varying from a few hours to many days. When the period between two paroxysms is very short, and only a few days in duration, the general condition barely ever becomes normal, for the patient complains of muscular debility, and is whimsical and petulant, and suffers disturbances of the digestive organs. The whole affection generally lasts only a few weeks or months, and, with the appearance of the menses, complete recovery is established. Relapses have also been observed in this disease, during which the catamenia disappeared, or became irregular. A state of extraordinary nutrition, and a disposition to obesity, take place in these girls after recovery, especially in the so-called spiritualists.

As regards the sex, the disease, according to a statistical report by *Wicke*, who has collected one hundred and twenty-six cases, attacked eighty-eight girls and thirty-eight boys. Of one hundred and seven patients in whom the date of the commencement of the disease could be ascertained, eighty-four were between the tenth and twentieth year of age, and, of these eighty-four, sixty-two were between the tenth and sixteenth year. An hereditary disposition is often observed, and these patients are almost always brought up by hysterical, eccentric mothers.

In regard to the organic basis of this disease, conjectures can only be formed. No certain parts of the brain are affected in any case, otherwise the symptoms would be more constant and uniform; and in no case can an inflammatory exudation or a permanent alteration of the form of the brain properly be assumed, because the disease almost always terminates in recovery, and only exceptionally ends in paralysis or epilepsy. In fact, the entire activity of the brain has simply attained to a high degree, and this disposition sometimes manifests itself most in great irritability of the motor nervous system, and sometimes, again, more in an exaltation of the psychical department of the brain. *Hasse* very fittingly observes: "There is only one condition which can be suggested to explain this singular disease, namely, sleeping and dreaming." When we bear in mind that such manifold, sometimes uniform, sometimes again changeable performances transpose the dream into actual action, we have in reality all the phenomena of the great St. Vitus's dance.

What tends to complete this analogy is, the circumstance that the paroxysms begin with a kind of sopor, a stupefaction, and terminate with an awakening, as from a dream; so that in chorea major, according to this view, we have nothing else than a potential, lively dream, with great irritability of the sensorium.

The *prognosis*, inasmuch as the disease is not fatal, must be favorable. The paroxysms almost always cease, although not until after a long time, and these persons always retain for life a something singularly *bizarre*, which begets a cautiousness about intercourse with them. They sometimes relapse into religious enthusiasm, sometimes into exalted love-affairs, and are rarely known to make quiet, sensible women.

Treatment.—There are no medicines which will certainly prevent the attacks, not even such as are capable of arresting the disease; but the general state of the system often furnishes opportunities for therapeutic measures. These girls, as a rule, suffer from chlorosis and obstinate constipation, on account of which iron and laxatives are usually indicated. The constipation, in most instances, is so difficult to overcome, that powerful drastics have to be employed, with which finally a few copious evacuations are obtained.

The desideratum is always the psychical treatment. If the paroxysms once become the subject of public wonder and town talk, they will not cease again for years. It is therefore necessary, first of all, to remove the child to a suitable neighborhood, and at the outbreak of the paroxysms remove it from its excited parents into private rooms. The attacks should be allowed to pass off quietly, and when passed they should not be mentioned. Never should the child be told what it said and did during the paroxysm.

All exciting studies and society should be strictly avoided; suitable bodily exercises and even active exertions have the double advantage that the digestion is thereby stimulated and the mind is diverted from pernicious fantasies. *Hasse* holds that the experiments with animal magnetism, and all experiments generally, are objectionable. In the only case which stands as a precept for me, I found cold water of decided benefit, and the paroxysms ceased entirely after the extremely eccentric child was separated from her half-demented mother and placed with her sensible grandfather. The fits consisted in this, viz.: the girl would suddenly sit down upon the floor, set up a peculiar grunting cry, and at the same time revolve with lightning-like rapidity. A few glasses of water dashed with force into her face soon brought her to her senses again, and after this had been repeated five times the paroxysms did not return.

(5.) EPILEPSY, MORBUS SACER, COMITIALIS, CADUCUS, FALLSUCHT, FALLING-SICKNESS, FITS.—By epilepsy we understand convulsive paroxysms which recur often and are accompanied by sudden abolition of consciousness and of the functions of special sense.

Epilepsy and its causes, the kind and the effects of the paroxysms, are so minutely treated of in the works of special pathology, that it does not seem necessary to here give a very exhaustive description, and the student may therefore be referred to the excellent delineations found in the works of *Canstatt*, *Romberg*, and *Hasse*. A few peculiarities appertaining to children only will be mentioned here.

Symptoms.—Very often, in adults, remote and almost always near premonitions (aura) are observed. The former consist of an altered disposition of the mind, great irritability, headache, vertigo, and a feeling of weariness. The latter, which immediately precede the attack, and are often so brief that the patients have barely time to prepare themselves for it, consist in headache, giddiness, tinnitus aurium, darkness before the eyes, perception of bad odors, trembling, chilliness, oppression and palpitation of the heart. In children the remote premonitions are mainly unnoticeable, for the reason that the attacks are much more frequent, recurring daily, or at least weekly, and therefore no very distinct prodromata appear. The near premonitions, the aura, are also unheeded by most children, because they pay very little attention to themselves generally. Indeed, while quietly playing, the child is usually surprised by the paroxysms with such lightning-like rapidity that in general no aura can be assumed to exist.

As regards the paroxysm itself, it almost regularly begins with an inarticulate, unnatural cry or moan, and with tears flowing from the eyes, by which it is claimed that the commencement of the paroxysm must be painful. All subsequent perception of pain, however, is abolished by the rapidly-supervening unconsciousness. During or immediately after the cry the child falls down suddenly; it does not, however, first sink down upon the knees and then on the floor, but drops down with such force that it seems as if prostrated by a violent blow. The direction in which it falls is decided by the position the body was in at the time of the seizure, and has no pathognomonic significance. Often it is dashed to the ground with such violence that serious injuries happen to it which may lead to death. It may be assumed with tolerable certainly that the more sudden the invasion and the prostration, the more violent and protracted will be the paroxysm.

After the child has fallen, the most variable convulsions begin, sometimes tonic, sometimes clonic; sometimes, again, they alternate. Epilepsy of children particularly distinguishes itself from that of the adult by the inequality of the spasms. While, in adults, especially men, one fit runs just the same course as another, in children the duration and kind of the convulsions often vary very much; nor does the same group of muscles always participate in the contractions. The most frequent phenomena are gnashing of the teeth, tetanic jerkings, and contractions of the extremities, contractions of the thumbs, backward curving of the spine, and the most multiform contortions of the muscles of the face and eyes. Still, none of these symptoms are so constant as that their absence should render the diagnosis of epilepsy doubtful, when the other diagnostic signs correspond. The popular supposition, that convulsions in which the thumbs are not contracted do not belong to epilepsy, is totally devoid of foundation. This symptom, though of frequent occurrence, is absent in a considerable number of otherwise well-pronounced cases.

In more violent paroxysms the respiratory muscles also participate, in consequence of which the breathing does not go on properly and rhythmically, and the expiration in particular, owing to the constant contractions of the muscles which ought to be relaxed, becomes laborious. As a result of this, the thorax becomes distended and the respiratory sounds are but feebly heard, if it be at all possible to auscultate the lungs. The general jactitation of the body, and the rattling in the throat of the accumulated mucus, however, often make an examination of the lungs impracticable. The direct effects of this disturbance of the circulation are: cyanosis, swelling of the veins of the neck, injection of the eyes, tumefaction of the tongue and entire face, and finally even bleeding of the mucous membranes of the conjunctivæ, nose, and mouth; not all hæmorrhages from the mouth, however, proceed from this source. Oftener they are the effects of wounds of the tongue inflicted by the teeth during the paroxysm.

The cardiac muscle seldom participates in the spasms; the pulse, in consequence of the general exertions, is indeed somewhat accelerated; still, it is not unrhythmical, and, immediately after the completion of the paroxysm, returns to its normal condition.

The urine and stools pass involuntarily more frequently in children than in adults, and white or even bloody foam at the mouth is also more frequently seen in them than in adults, because the secretion of mucus and saliva is generally much more plentiful. In consequence of the great bodily exertion, a profuse perspiration breaks out at the end of the fit, the strong contractions subside, and the children wake up as from a dream, and, sighing deeply, stare about bewildered. Hardly ever do the attacks last longer than five minutes, but to the anxious parents the time naturally seems much longer, and is unintentionally greatly exaggerated. Although there are many adult epileptics who barely suffer one paroxysm a year, the children afflicted with this disease are attacked by it at least once a week; still, no approximation to any regularity can be noticed: sometimes long pauses ensue, sometimes the paroxysms appear every day, sometimes several follow each other at the same hour, so that it was actually thought that it had an intermittent character, and quinine was therefore administered—always, of course, without the least effect. Sometimes, again, they appear at different times of the day.

The individual symptoms are not always so conspicuously developed as the above delineation declares, and there are also many milder forms which have been covered by the name of epileptic vertigo. In this form the child does not fall down; it may stagger somewhat at the most, seek to sit down, or, when attacked while walking, continue on its way as if in a dream, with rigidly-contracted features. This condition barely ever lasts longer than a minute, but recurs often during the day. Some children have paroxysms of different degrees of severity, sometimes only a slight giddiness, sometimes violent convulsive fits, with prostration. There are the most multiform gradations, from slight giddiness, up to horrible paroxysms, attended with rupture of muscles, fractures of bones, and hæmorrhages. After a mild attack the children recover promptly, and eat and play as before, but after a severe one they sink into a long and profound sleep, from which they awake with headache and fatigue, which generally last for several days.

During the intervals the state of the health differs according to the duration, severity, and frequency, of the paroxysm. Some children, who only suffer from the milder form, retain their healthy appearance, and continue to develop both bodily and mentally; others, however, especially after an epilepsy of several years' duration, acquire a brutish expression of countenance, become morose, choleric, ravenous, and retrograde instead of progress in their mental development. Their physical development is also arrested, and they ultimately degenerate into complete cretins; cicatrices and contusions, the effects of the falls, are found on the body; the teeth, from the constant grinding, are worn off; and the tongue is fissured by the wounds it has received.

But milder forms of the disease are borne throughout life without any ill consequences, as is shown by the well-known fact that many persons eminent for their mental endowments have suffered from epilepsy to the end of their lives. The most prominent of this class of epileptics are: *Julius Cæsar*, *Mohammed*, *Charles V.*, *Petrarch*, *Fabius Columna*, *Rousseau*, and *Napoleon I.*

The *course* of epilepsy is decidedly chronic, for the patients retain it for life and take it with them to the grave; the commencement is eminently acute, for in most cases very uncertain premonitions precede it, and the disease can be diagnosticated only after the first paroxysm has appeared. The younger the child, the more frequent the paroxysms; and they diminish in frequency with advancing age till about the period of puberty, when they again become frequent, and so continue for more or less time, and finally assume a more constant form, and the intervals become more uniform. The disease is decidedly aggravated by onanism, spirituous drinks, and all kinds of mental excitement. No scientific connection can be demonstrated to exist between epilepsy and the growth and decline of the moon, a very common supposition among lay people. On the other hand, the climate, or perhaps only the temperature, is not wholly devoid of influence in some cases. I am acquainted with a man who in the cold winter months suffers from a mild epilepsy, but in summer is entirely free from it. For the last two years he has spent the winter in Algiers, and has been free from the attacks.

Epilepsy is arrested during acute febrile diseases, but is exacerbated by chronic affections, such as helminthia, constipation, and neuralgia. The influence it exercises upon the mental functions has already been spoken of above.

The usual *termination* is, in fact, in death. Epilepsy, it is true, does not prevent the child from growing up to thirty or forty years of age, but it appears from statistics that it very seldom outlives this age. Serious cases usually run into other cerebral diseases, such as cerebral apoplexia, mania, or imbecility, which are soon fatal. Recovery is a very rare occurrence; less so, however, in children than in adults. In children, epilepsy has been seen to disappear after the cutting of the four molar teeth, and sometimes upon change of residence. Additional minutiæ upon this point are to be found in the section on etiology. Recovery either takes place suddenly or gradually. The last paroxysm is either just as violent as the previous one, or the fits disappear gradatim, and first merge into mild epileptic vertigo, and finally disappear.

Etiology.—Difficult as it is, in most cases, to fathom the true cause of epilepsy, a particularly careful examination, and close inspection of the body, must nevertheless be practised, for it may discover something upon which to found a rational treatment. The form of the attack furnishes little or no data for the etiology. Even the kind of aura preceding the attack is not available in children, since in general it is very short, and is immediately forgotten after the fit.

As regards the *age*, epilepsy spares none. Young children in general rarely suffer from true epilepsy, as we might expect, if the more frequent eclampsia be regarded as a distinct disease. Eclampsia is easily distinguished from the disease under consideration, by the fact that it almost always occurs at the breaking out of an acute affection only; that the general condition of the patient, after the termination of the convulsions, is not restored; and that it is often fatal, while epileptic attacks are almost always devoid of danger.

According to a statistical compilation by *Beau*, two hundred and eleven epileptics present the following history:

Congenital epilepsy...............	17	From beginning of 20th to 30th year	29
From birth up to 6 years of age.....	22	" " 30th to 40th "	12
" beginning of 6th to 12th year..	43	" " 40th to 50th "	15
" " 12th to 16th "	49	" " 50th to 60th "	5
" " 16th to 20th "	17	" " 60th to 61st "	1

It will be seen that two-thirds of these patients, at the invasion of the disease, had not attained the sixteenth year.

As regards the *sex*, it is generally assumed that in adults more women are epileptic than men. I am not aware of any tabular compilations of epilepsy in children arranged according to the sex, but, from the cases which I have so far observed, the statement above given as to adults will not apply to children, for I can recall to mind more epileptic boys than girls.

The *hereditary nature* of epilepsy is generally acknowledged, even among lay people. It is by no means necessary that the inherited epilepsy should also be congenital, i. e., occur immediately after birth; it may remain latent for a long time, and only come on at the period of puberty, or even still later. Congenital epilepsy is especially observed when epileptic mothers suffered from frequent paroxysms during pregnancy. In children under one year of age, it is very difficult to distinguish it from eclampsia, or general convulsions, and it is only characterized by its chronic course, and by its not being followed by any acute disease after the fit has passed off.

Epilepsy sometimes overleaps a whole generation, and appears in the second with all its former severity, or it attacks only portions of the descendants, sometimes the male, sometimes the female.

Besides the causes already assigned, there are many others mentioned in the text-books; few of them, however, are demonstrable. Thus, for example, it is claimed that great mental excitement, especially from fright or anger, is a very potent cause. If this were the case, the great majority of persons ought to be epileptics. Various forms of epilepsy, according to the locality of the aura, have been distinguished, such as epilepsia spinalis, thoracica, abdominalis, nephritica, genitalis, and peripherica, without it being possible, however, to confirm these varieties by *post-mortem* appearances.

An epilepsy excited by tuberculosis chiefly occurs in children. A large tubercle in the bronchial glands, or in the brain, an hypertrophied tuberculous lymphatic gland exerting a pressure upon the circumjacent nerves, are some of the supposed causes of epilepsy. In rare cases, cryptorchidismus is the alleged cause. These recover after the testicle has descended, or, if arrested in the canalis vaginalis, after the testicle is removed. Of the peripheral causes, the most frequent is the eruption of a cuspid or wisdom tooth, after which a recovery has been seen to ensue. Epilepsy is repeatedly reported to have been cured by the excision of a cicatrix. These instances, however, are very rare, although all epileptics, since that fact first became known, are closely examined for cicatrices, which, when found, are excised with the best of hopes; still, the paroxysms are generally in no way affected by this operation.

The *post-mortem* examinations of epileptics furnish no uniform results whatever. They sometimes turn out to be totally negative. In many cases the most variable lesions of the brain are found, atrophy and hypertrophy, induration and softening, plastic and serous exudations on the meninges, hæmorrhages, tubercles and abscesses in the substance, hernia, exostosis, caries or necrosis of the cranial bones. In congenital epileptics, in addition, there are found asymetrical cranial bones, flattening of the forehead, a broad or pointed occiput; the bones of the skull are sometimes remarkably thickened; sometimes, again, attenuated. *Elliotson* is perfectly correct when he says that this kind of cranial bones does not necessarily produce epilepsy. It is, however, certain that this evil very frequently occurs in imperfect development of the brain. In the older medical works, vascular congestions of the brain and spinal cord play an important part, but lately these anomalies of the distribution of the vessels have justly come to be regarded as phenomena occurring at the time of, or even after death. The *post-mortem* appearances in the other organs may vary still more than those of the brain; in other words, epileptics may perish not only from the effects of this chronic malady, but also from all possible acute and chronic diseases. On carefully dissecting the nervous centres, neuromata have also been frequently found.

Diagnosis.—The main difficulty in the diagnosis in female adults is to distinguish hysterical attacks from the truly epileptic. But that is chiefly and especially accomplished by the circumstances that, in the former, consciousness is not wholly abolished, and for that reason also no prostration and no wounds from the teeth occur. In children it is not hysteria but eclampsia that may be confounded with epilepsy. It is impossible to distinguish an eclamptic fit by itself from an epileptic one, but the condition by which it is succeeded furnishes a correct differential sign. After an eclamptic attack, the child never feels perfectly well; it is always feverish, suffers from an acute exanthema, or some other acute disease, or vomits at least the undigested contents of the stomach. Epileptic children are perfectly well on the same, or, at least, on the next day, and are free from all signs of fever.

Spoiled children sometimes also take it into their heads to feign epilepsy, in order to escape corporeal chastisement, for they observe that truly epileptic children are never very severely punished. Those who attend large schools, and inmates of educational institutions, have great facilities for acquiring this simulation, for they have frequent opportunities to observe epileptic children. It is not always easy to distinguish the feigned from the genuine epilepsy in children who are refined and possess imitative talent. Under no circumstances should simulation be assumed unconditionally, so long as there is no positive proof. The tutors should be instructed to treat such children with the same indulgence as they would treat genuine epileptics, and should rather allow themselves to be imposed upon for a time than to aggravate the condition of a really sick child by undue severity. It is, however, scarcely possible that the impostors will ever succeed in imitating the strong turgescence of the face during the paroxysms, and still less the subsequent abnormal pallor. It is very difficult, according to *Marc*, to extend the thumbs and open the hands of a genuine epileptic, but, after this has once been accomplished, the hand will stay open. The feigner is not aware of this peculiarity, and will shut his fist again as soon as he feels no resistance. In regard to this sign, however, a great number of epileptics have yet to be examined before undoubted value can be awarded to it.

Treatment.—The practical therapeutics of epilepsy is perhaps the most extensive, and at the same time most unprofitable of any disease. All possible remedies are administered, and such brilliant success is ascribed to them, that it requires great medical skepticism to doubt them. The supposed good effects of many remedies may also be based upon error, or at least self-deception and imperfect observation, but a correct inference as to their value is rendered still more difficult by the circumstance that, from all remedies, no matter what may be their chemical composition, a decided improvement is always obtained at first. This observation, first made by *Esquirol*, has since been confirmed by great numbers of observers, and clearly shows that the psychical state possesses great influence upon the morbid process.

The treatment itself comprises (1), the prophylactic; (2), the removal of the cause; (3), the use of specifics; and (4), a general bodily and mental hygiene.

(ad 1.) The *prophylactic* treatment, on account of the acknowledged hereditary character of the disease, consists in restraining epileptics from marrying, and in preventing an epileptic mother from suckling her child, and in treating the children of epileptic parents with the utmost possible forbearance. Over-stimulation of the nervous system by early and exacting studies, or by exciting impressions, such as scoldings, chastisements, ghost-stories, etc., is to be avoided.

(ad 2.) The treatment directed to the *cause*, where the cause can really be fathomed, is by far the most favorable. But, unfortunately, it is much less possible to discover the true cause than is usually supposed, for the statements of the relatives, of a fall, fright, or of a grave sickness recovered from, etc., should be received with the utmost caution. First of all, the child should be undressed, and every part of the body subjected to a critical examination; the assertion of the relatives, that the entire body is normally formed, should never induce us to forego this examination. By it a tumor pressing upon a nerve, a cicatrix involving a nerve, or a foreign encysted body, has often been discovered, located in the course of the peripheral nerves, whose removal was followed by the disappearance of the epileptic convulsions. It is even stated that epilepsy has been cured by the excision of corns, and extraction of carious teeth (?). In this peripheral epilepsy, the exsection of the affected nerve is attended by the surest effects. The condition of the brain and its adjacent parts, of course, deserves special attention. The cranial bones should be carefully examined for depressions, otorrhœa, syphilitic exostosis, etc.; chronic congestive conditions of the brain should be relieved by revulsions to the alimentary canal, or by derivatives, and counter-irritants, such as vesicants, irritating ointments, setons in the nape of the neck, and even moxas. With this object in view, the carotids have even been tied, and recently a trial of compressing them has been made. Both these measures, however, proved ineffectual. Trephining of the formerly injured cranial bones is also indicated, in cases where the paroxysms do not improve after the cicatrix of the scalp has been excised. *Tissot* thinks so highly of this operation, that he recommends it to be tried in all desperate cases.

When worms are present, they are to be removed by the methods suggested in the chapter on "Intestinal Worms." Disposition to constipation should be obviated by frequently-repeated clysters, or aperient waters. The genitals should be closely examined for evidences of onanism. Rapidly-cured eruptions of the skin and arrested habitual sweatings may sometimes be reëstablished.

The *treatment of the paroxysm itself* essentially consists in protecting the body against injury. The furniture of the room occupied by the patient should not present sharp, exposed corners, the stove should be guarded, the floor covered with carpets, and the couch should be low, so that the patients may not sustain serious injury should they happen to fall from it during their nocturnal attacks. They should never be left without surveillance. All restraint at the commencement of an attack is injurious, and tight garments should be loosened. All measures employed during the paroxysm, such as frictions, sprinkling of cold water, compression of the carotids, magnetism, inhalation of irritating gases, opening of the thumbs, and tying the face, however popular these may be, are either useless or injurious.

The attempts in a protracted aura to prevent the fit itself have not heretofore proved very successful. On the whole, only those paroxysms which are of peripheral origin may possibly be arrested. The remedy consists in tying the affected limb tightly with a strong ligature, which is gradually slackened after several hours. By this means it is certainly possible in some cases to prevent the paroxysm altogether; in others, however, it causes the utmost dread and apprehension, and the patients insist upon the speedy removal of the ligature, preferring to suffer the convulsions. Children generally rally very rapidly after the fit, so that there seems to be no occasion for an after-treatment. Sopor, a feeling of weariness or nausea, which occasionally remain behind for some time, are quickly relieved by a sinapism or a derivative foot-bath.

(ad 3.) The *anti-epileptic specific remedies* have lately become so fearfully numerous, that the denomination "specifica" may be regarded as a veritable disgrace to the physician. It would be of no use to copy here the whole list of the anti-epileptica that were and still are used. Those most extensively employed only will be briefly mentioned.

For the treatment of the recent attacks the following remedies, according to *Köhler*, are appropriate:

(1.) Rad. artemisiæ vulgar., 10 to 20 grs. of the fresh powder, given as short a time before the fit as possible.

(2.) Rad. valerianæ, daily, ℈ss to ℈j of the fresh powder.

(3.) Flores zinci, gr. j to x, or in as large doses as possible, is recommended by many physicians, especially *Herpin*. The treatment should be continued for three months. Valerianate of zinc is, in fact, a combination of two remedies for epilepsy, but the effects of the zinc do not seem to be improved in the least by the valerian. Others prefer the sulphate of zinc, and give it in j to v grain doses pro die.

The following remedies are employed in older cases, and in which those just described have proved ineffectual:

(1.) Ammoniate of copper and the various preparations of copper with which, owing to their nauseating properties, it is not usually possible to go beyond $\frac{1}{8}$, at the most $\frac{1}{4}$ grain doses.

(2.) Argent. nitrat. is recommended by many physicians, especially by *Heim*. In children it must be given in $\frac{1}{6}$ to 1 grain daily for years. There seems to be no very great danger of the skin becoming gray from it, as that happens in only a very few patients. I, for instance, notwithstanding a most extensive employment of this remedy, have never yet observed that result. The great precaution that is taken to introduce the nitrate of silver, as such, into the stomach, is probably superfluous, for the combinations of chlorine which are constantly present in the gastric secretions must certainly convert it quickly into a chloride.

(3.) Mercury, internally in the form of calomel, sublimate, or cinnabar, or externally in the form of blue ointment, is only indicated when there is a suspicion of the presence of Tophi syphilitici. It, however, must not be forgotten that, on account of its consecutive constitutional effects, it may prove very injurious.

(4.) The additional metallic remedies to be mentioned are, acetate of lead, oxide of zinc, nitrate of bismuth, the preparations of iron, manganese, and arsenic.

(5.) The narcotics have been extensively employed, and are invariably found in the numerous secret remedies. No certain curative effect has been derived from opium, but a rapidly-developed imbecility has very often indeed been observed from its use. Rad. belladonnæ, and latterly atropine in gr. $\frac{1}{60}$ to $\frac{1}{10}$, chloroform, ether, ext. stramonii, hyoscyamus, digitalis, agaricus muscarius, narcissus, pseudo-narcissus, nux vomica, and strychnine (gr. $\frac{1}{30}$ to $\frac{1}{2}$ pro die), have been repeatedly recommended.

(6.) Finally, there is yet a list of vegetable and other kind of remedies from the various classes of the materia medica: selium palustre, indigo, viscum quercinum, sedum acre, folia aurantiorum, radix pæoniæ, cotyledon umbilicus, scutellaria geniculata, assafœtida, moschus, castoreum, camphor, amber, cinchona and its preparations, rad. dictami albi, pepper-corn, turpentine, Dipel's oil, phosphorus, and the mineral acids.

(ad 4.) *The general bodily and mental hygiene* is of great importance. The diet should not be too nutritious, and alcoholics should be prohibited altogether, for in many patients a fit is induced by indigestion, and, still more surely by a use of alcoholic drinks. Constipation should never be permitted. It is of especial benefit, in all cases, to stimulate the functions of the skin by cold and warm baths, so as to produce copious perspiration. Bodily exercise, especially in the open air—for example, in garden and field—often effects a complete cure. Of the bodily exertions, only such, of course, are to be chosen as will not of themselves induce a paroxysm; riding and swimming, for example, can hardly be recommended. Travelling and change of climate, particularly changing a colder for a warmer, often bring about a suspension of the paroxysms, to which the diversion and the agreeable state of the mind which result from some travels may contribute not a little. It is a well-known fact that children are seldom attacked while playing, or when occupied, but only at night, or when they sit morose and idle.

They should not be encouraged to forego mental exertions, for the mind, if not exercised, sinks into a state of unhealthy torpor. But the hours of study should be so arranged as to allow sufficient intervals of rest; and they should be taught in such a manner as to interest them in their studies, and thus render learning comparatively easy —a fact, however, every tutor does not know, and a result he does not know how to accomplish. These children should not, if possible, be sent to the public schools, for most of them learn much slower than healthy children, and, on account of the fits, are feared and even derided by the latter. Under these circumstances the mental depression becomes considerably aggravated, and it is a serious detriment to a person, in after-life, that his previous affliction should be generally known, although he may have been subsequently cured of it.

APPENDIX.

Diseases of the Mind.—In children, *imbecility* and *idiotism* predominantly occur. It is necessary to discriminate between real idiotism and arrested or retarded development of the mind, although there certainly are steps of transition where this distinction is difficult to make. The development of the body, also, in real idiots, is always visibly retarded, while many children, with extremely feeble mental endowments, the so-called *enfants arrières*, corporeally thrive all the more. Marked abnormalities are also always detected in the skull of idiots, which are due to the smallness of the brain.

The circumference of the skull is small, the head is compressed or pointed from before backward, or from side to side, in contrast to endemic cretinism, which is found most typically marked in some of the valleys of the Tyrol, and which manifests itself by the form of the skull approaching more that of a square, and by hypertrophy of the bones.

Idiotism, depending upon smallness of the brain, occurs sporadically, and seems to be promoted by intermarriage.

Out of one hundred idiots, according to statistical compilations by *Bemis*, of Kentucky, fifteen were the progeny of marriages that had been formed between cousins. Cretinism occurs chiefly in narrow, dark valleys, and is very seldom observed on the plains. Whether coitus during intoxication will also produce idiotic children, is much doubted, for, if this were the case, these would undoubtedly be more numerous.

Symptoms.—The degree of idiotism varies exceedingly. In the extreme degree, all mental action is defective, and the organs of sense perform their functions very imperfectly. Deafness is frequent. Complete idiots are incapable of learning to speak; they do not even attempt, by stammerings or mutterings, to make themselves understood; the cry is rough and monotonous. The children learn to sit very late, but never to walk. They swallow greedily the food allowed them, without tasting it; they allow the urine and stools to pass off uncontrolled. In consequence of this torpor, the muscles of the body become atrophied, and the integument covered with ulcers, from pressure and filth. Fortunately, most of these individuals die of convulsions during the first dentition, and never attain to puberty.

In those cases of less severity the children learn to stammer and to walk, and instinctive movements also take place. They call for food and drink, recognize the objects by which they are surrounded, and become fond of cleanliness. They also, in some cases, learn to perform simple physical acts, in the same manner as educated animals.

But their gait always remains unsteady, the expression of the countenance silly, and the muscular system weak, while convulsions, and subsequently paralysis, often ensue. These children very seldom live past the first and second dentition, and at best attain to no great age.

In the mildest degree—that of simple mental debility—the smallness of the head is not very striking, the body develops itself, although slowly, to its almost normal formation, and one or another sense only remains blunted, but asthenopia, or deaf-mutism, also makes these individuals useless members of the human family.

Treatment.—Defective formation of the brain, of course, can never be the subject of direct treatment, but, by a proper rearing and education, something may possibly be accomplished in waking up the feeble mental powers. In order to keep such children alive as long as possible, the first requirement is to habituate them to cleanliness, without which, ulceration of the skin, quickly followed by atrophy, results.

It is best to remove these children from the paternal home, for the long period of time and the rigid surveillance requisite for their improvement are seldom to be found in their own.

Then it is a question whether it is possible, by incessant, careful observation, finally to discover the existence of one or more faculties, and to persevere in their progressive cultivation and improvement. The main difficulties encountered in this are the indolence and the complete abstraction of the idiots.

The education of these poor creatures requires an almost superhuman patience—such, indeed, as is very seldom found, their uncleanly habits adding much to these difficulties.

Other diseases of the mind, in young children, are very rare, but, after the completion of the second dentition, they are oftener observed. Out of one thousand cases of insanity, according to statistical compilations of cases that have occurred in Bicêtre during three years, on an average, ten were youthful idiots, epileptics and imbeciles not included.

From a most careful inspection of these cases, it was found that, aside from the hereditary disposition and previous disease, improper education and want of care were the chief causes of their condition.

Le Paulmier, the compiler of these statistics, distinguishes three forms of mania in the young: (1), maniacal exaltation; (2), insanity; and (3), madness.

In the first form, the faculty of judgment is not completely abolished; still, a marked deficiency of reflective faculty exists. The patients are talkative, excited, vain; are a prey to foolish dissipations, as well as shameless and violent acts.

In the second degree, insanity, the confusion of ideas is more pronounced; the patient incessantly jumps from one subject to another, or from one extreme of feeling to another. In the third and highest form, all association of ideas is abolished, and panphobia and mania, the signs of commencing paralysis and imbecility, not unfrequently become superadded.

Independent of the real symptoms of mania, psychosis in the youth is often complicated with chorea, or a kind of catalepsy, which comes on at uncertain intervals, and in paroxysms of greater or less duration. *West* speaks of children affected with mental diseases, who were only six or seven years old; generally, however, the majority of these have attained the tenth year, and are approaching puberty.

The prognosis, in general, is more favorable than in adult dementia, but, according to *Delasiauve*, there is always a great tendency to relapses.

It has been observed that, the longer the stadium of premonition lasts, the worse is the prognosis. We are justified in the conclusion that, although the cure often appears permanent, a psychical disturbance occurring in childhood is always to be regarded as a very serious disease.

The *treatment* in the paternal house is but very seldom effectual, and hence it is absolutely necessary to have these patients removed to an asylum.

D.—*HIGHER ORGANS OF SENSE.*

1.—Sight.

Ophthalmology has grown into such a perfect specialty that a general treatise on the diseases of children need not comprise a detailed delineation of the diseases of the eye.

The student may therefore be referred to the works on ophthalmology for information upon this subject, and only the congenital diseases of the eye, and those that occur in infants especially, will here receive a very cursory description.

(1.) EPICANTHUS.—By epicanthus is understood an unsightly gathering of integument in the region of the root of the nose, toward the inner angle of the eye, a semilunar fold covering the angle of the eye in the form of a pocket. The upper point of this crescent is found at the root of the nose; the lower is lost in the integument of the cheek.

The root of the nose is always very flat, and the nasal bones meet each other at an obtuse angle, so that the folds of the integument, elevated by the accumulation of adipose substance, are on a level with the depressed nose.

The pocket never extends so far as to obscure the field of vision, but completely covers the inner angle of the eye, and may reach to the inner margin of the cornea.

The cause of this deformity, according to *V. Ammon*, is a flat dorsum of the nose, and a lax adhesion of the integument to the nasal and lachrymal bones. This etiology, however, is not very satisfactory, for there are also children with depressed noses, and easily displaceable integument, who exhibit no such fold whatever.

Epicanthus is always congenital and bilateral, but it may be larger on one side than upon the other. When the skin on the dorsum of the nose is raised up with two fingers into a fold, the deformity disappears, and this fact suggests the proper operative procedure. As the epicanthus is usually seen in the new-born child, and never in the adult, it follows that, with increasing growth, it must become smaller and ultimately disappear.

This deformity, where it does not thus disappear early, may be remedied by excising a longitudinal fold of skin from the dorsum of the nose, and uniting the edges of the wound by suture.

(2.) CYCLOPIA—MONOPHTHALMIA.—Total defect of the orbits occurs in monstrosities, the frontal bone continues down into the upper jaw, and in the bone shallow grooves only exist in place of the orbit. In defective formation of the brain (hemicephalia), the bones of the orbit are only rudimentarily formed, and its upper border, in particular, is very much diminished, and very close to the optic foramen.

Cyclopia finally is likewise only possible in defective orbital bones. Here the ethmoid, the lachrymal, and the nasal bones are absent, and the sphenoid bone is also altered in shape. These are mere malformations, met with only in monstrosities incapable of living, and are, clinically, of no interest.

(3.) MALFORMATIONS OF THE EYEBALL.—(a.) *Coloboma iridis s. iridoschisma*, a congenital splitting of the iris, is a condition similar to that of harelip; the fissure in most cases runs downward, and the deformity is more frequently seen in both eyes than in one only. Its edges converge toward the ciliary border, and are but seldom parallel or diverging, so that the pupil mostly assumes the form of a pear, with the base directed downward. In rare instances a fissure in the large circle of the iris alone is observed, so that a normally round pupil, with a peripheral, triangular opening, separated from the pupil by an iris-colored transverse band, is present. By the alternate presence and absence of light in front of a coloboma, its margins may be seen to shorten and elongate like the contractions and dilatations of the pupil, but this closure never is great even under the influence of a strong light.

This condition has often been observed as an hereditary one. The complications occurring with it are: microphthalmus, ovale corneæ, central lenticular cataract, harelip, hypospadias, cerebral defects, and coloboma of the *upper eyelids.*

The latter is only observed on the upper eyelid, and consists in a narrow fissure of the tarsal cartilage, in which the external integument is not correspondingly fissured.

There is no embryological explanation for this malformation, such, for instance, as is readily found for harelip, for the upper eyelid at no time of embryonic life consists of two parts.

(b.) *Irideremia.*—Total or partial congenital absence of the iris is always observed simultaneously on both sides, a single instance reported by *Morison*, excepted. Either no iris, or but a rudimentary strip only, is seen.

Here the pupil properly never presents the background of the healthy eye. In certain positions, with reference to the light, they glisten like the eyes of cats. This also happens occasionally in large colobomas. Usually the cornea is not normal, it is oblong, or gradually merges into the sclera, and the lens may likewise be opaque.

Such children naturally are always short-sighted, and, on account of the too great amount of light admitted, constantly contract their eyelids, by which means they obtain a sort of substitute for the deficiency of the pupils.

A constant rolling of the balls (nystagmus oscillatorius and rotatorius), on account of this incompleteness of the power of vision, also becomes superadded. This malformation, according to *Arlt*, has never led to blindness by paralysis of the retina, but inflammation of the cornea and conjunctiva, and also gradual lenticular opacity, very frequently ensue.

The treatment must be confined to efforts to control the amount of light admitted to the eye, by the use of blue glasses or artificial diaphragms.

(3.) *Hard Cataract.*—Cataracta nuclearis is a sharply-defined, grayish-white point, of the size of a poppy-seed, in the centre of the lens, around which a brighter zone is sometimes observed. It is mostly met with in both eyes, and is often complicated with absence of the iris or coloboma.

In addition, white points also develop themselves in children after birth, in the lens or its capsule, and send out white radiating stripes, thereby *obscuring* the vision, but not entirely destroying it, as the opacity of the lens never becomes general.

(d.) *Atresia pupillaris congenita.*—Congenital closure of the pupil is due to an anomalous continuance of the pupillary membrane after birth.

According to *Bischoff*, the membrana-capsulo-pupillaris, and the membrana pupillaris together, form a vasculo-membranous sac, which, issuing from the posterior circumference of the lenticular capsule, extends through the posterior chamber of the eye as far as the iris; here it is connected with the iris by vessels, and by its anterior wall represents the membrana pupillaris.

But this sac originally seems to envelop the lens and its capsule only, for the lens at an early period lies closely behind the cornea, and no iris as yet is present. But, when the iris begins to develop itself, it becomes united to the anterior part of this sac, holds the united membrane back as the lens recedes after the formation of the anterior chamber of the eye, and thus a true membrane originates before the pupil, the membrana pupillaris.

This membrane, it is said, begins to disappear from the seventh month, and should be wholly gone at birth, but often it remains as a transparent membrane, with few or no vessels, for a long time yet after birth.

There are a number of cases in which, according to *Stellwag* von Carion, the pupillary membrane has been seen in its integrity in new-born children, and even in adults. It is seen as a fine, grayish-white membrane, accurately expanded on a level with the pupil, closing it, thereby destroying the power of sight to some extent, and making the iris immovable. In some instances this membrane is perforated, or a few shreds only hang on the pupillary borders. *Stellwag* warns us against the possibility of confounding this condition with organized exudation and capsular cataract, and considers the prognosis of congenital closure of the pupil as favorable. Nature, in time, makes amends for what it was remiss in at birth. The action of the iris muscle lacerates the membrane, and the torn fragments are gradually absorbed.

The evil, on the whole, is very rare, and many busy oculists have never met with it.

So much in regard to congenital malformation of the eye. The period of infancy is decidedly predisposed to diseases of the eye, and we should have to compile a complete treatise on ophthalmology if all the morbid conditions occurring in it were here to be described.

Two affections of the eye, specially belonging to children, blennorrhœa of the new-born child, and œdematous conjunctivitis during dentition, have already been minutely treated of in their appropriate chapters, pages 73 and 110. Scrofulous affections of the eye in children will be described in a future chapter on scrofula.

The other diseases of the eye differ little in any respect from those that occur in the adult, and consequently may be properly omitted here.

It should be observed that, in children, the outer structures generally, and especially the conjunctiva, the lids, and muscular apparatus, become diseased, while adults more frequently suffer from morbid alterations of the inner parts of the eye, the iris, lens, vitreous humor, choroid, and retina.

II.—Hearing.

I.—MALFORMATION OF THE ORGAN OF HEARING.—(a.) *Absence of the Auricles* (Ears), *Defectus Auriculæ.*—Occasionally an abnormal congenital smallness, shrinking, or a complete absence of the auricle, upon one or both sides, occurs, and is usually complicated with malformations of other organs.

Aside from the very striking deformity, this defect also causes a detriment to the hearing, although it is but a slight one.

If any treatment to mask the deformity is to be instituted, the first measure should be properly shaping the hair so as to cover the ear. If for any reason this be not available, there will be no other resource than to wear artificial ears. Artificial ears are made either from papier-maché, pressed leather, or cast metal, painted in oil-colors, and attached to the rudimentary auricles by the aid of a clamp, or, when no point of attachment at all exists, by a spring, passing over the top of the head, which is hidden by the hair. This, naturally, is only applicable to older and controllable children. Otoplastic surgery, the formation of ears from adjacent integuments, has never, according to *Rau*, succeeded in producing a structure at all resembling auricles, and hence, on account of the painfulness of the operation, and the impossibility of preventing cicatrices, should be abandoned entirely.

Aside from the absence of the auricle, a faulty position of this structure is also met with. It either lies very close against the cranial bones, *auricula adpressa*, or it stands off at a right angle from the skull.

The first deformity rarely calls for any surgical interference, although the fineness of hearing is somewhat weakened, but in the latter we are often applied to for the purpose of improving the appearance. In new-born children very prominent ears may readily be brought into a proper permanent position by means of strips of adhesive plaster which are applied for several weeks. A child was once brought to me with one auricle perfectly normal, while the other was bent forward or rather deflected to such a degree that its posterior surface only was seen, completely covering the meatus.

Even this marked deformity was permanently relieved by the application of strips of adhesive plaster for several weeks.

(b.) *Closure of the Meatus Auditorius, Atresia, sive Obliteratio, sive Imperforatio Meatus Auditorii.*—It sometimes certainly happens that the osseous canal, in consequence of abnormalities in the bones, is entirely absent; generally, however, it is normally present, and its mouth is only closed by a membrane.

With this condition, a defect or deformity of the auricle becomes associated as a complication.

The aperture of the canal is either indicated by a small depression, or the closing membrane is so smoothly expanded over it that the bony orifice cannot be detected with certainty either by the touch or sight. This pseudo-membrane is seldom seen to dip so far inward as to represent the canal as a short *cul-de-sac.*

This membrane is distinguished from the membrana tympani by its superficial position, and by its insensibility when touched with the probe.

The hearing is almost entirely abolished by this condition; fortunately, however, the malformation occurs only in one ear. This membranous closure must also be distinguished from mechanical occlusion of the meatus by vernix caseosa, or, in older children, by filth and foreign bodies of all kinds.

The occlusion of the ear often remains undetected for a long time when the auricle is well formed, and is discovered by the children themselves in the course of years, and as they gain in observation.

Treatment.—This defect can only be relieved by an operation. This consists in making a crucial incision into the membrane, which is expanded over the orifice; the flaps are seized by a fine, hooked forceps, and are snipped off with a curved scissors.

The after-treatment is the most difficult part of the operation, for there is always a great tendency to reclosure, which must be overcome by the introduction of pledgets of lint, sponge-tents, and subsequently a silver tube.

The meatus, notwithstanding all this, sometimes closes again after many months.

In bony occlusion, which scarcely ever occurs without other remote malformations, hemicephalia, etc., nothing of course is to be hoped for from an operation.

(2.) Simple Inflammation of the Meatus Auditorius (*Otitis Externa*).—We omit the inflammations and other alterations of the auricle, which, like any other part of the corporeal surface, may be attacked by various cutaneous diseases, and apply ourselves directly to *otitis externa, acuta, et chronica.*

Symptoms.—The meatus represents a *cul-de-sac*, the bottom of which is formed by the membrana tympani. Its anterior part is provided with sebaceous glands, its posterior, corresponding to the bony canal, with ceruminous glands. Although its lining membrane, as far as the sebaceous glands extend, is analogous to the external integuments, still the characters of the membrane lining the osseous canal are altogether different.

The denomination mucous membrane is not at all appropriate, for, in the physiological state, it is arranged for the secretion of the cerumen, which has not the least resemblance to mucus.

In the inflammatory processes the secretion certainly becomes muco-purulent, and, with the exception of its smell, is not distinguishable from that of an ozœna, and then it may indeed be assumed that the membrane so diseased has assumed the properties of a mucous membrane. When this metamorphosis takes place, the ceruminous glands cease to perform their function; the reappearance of this cerumen may therefore be looked upon as a sign of commencing improvement.

In the inflammation of the meatus we may distinguish an erythematous and a catarrhal form.

In erythematous otitis, the meatus, when closely examined by the aid of the speculum, is seen to be reddened, and a brownish cerumen, somewhat increased in quantity, is found. After several days, the whole meatus desquamates in large or small scales, the large quantity of cerumen dries into a crumbling crust, which falls out when the patient lies on the affected side, or is washed out by injections. This very frequent disease is almost painless; the auricle may be pressed and pulled in every direction, without causing any pain. The general state of the system remains undisturbed, and, in children, its presence is usually accidentally detected in the examination for other diseases.

Catarrhal otitis produces more significant local and general symptoms than the erythematous.

The invasion of the disease is attended first by an itching, then by actual pains, which, without any other alterations, may last for several days, when a yellowish-white, purely fluid or flocculent fluid discharge appears. This, at first, is nearly odorless, but at a later date assumes an intensely sour odor, or like that of rancid fat. The discharge is not always equally profuse, and its quantity is best estimated by the stains which are found in the morning on the child's pillow.

In a profuse otorrhœa, these stains cover the pillow with patches the size of half of the palm of the hand. After a few days or weeks the discharge in the simple otitis externa ceases; it becomes cheesy, and the ceruminous secretion reappears. The deafness that existed during the otorrhœa also passes off. Generally, the secretion poured out dries in part in the auricle, and by the irritation it causes produces erosions and superficial ulcers, which extend to the lobe and adjacent parts, and are much disposed to bleed. At the same time the membrane lining the meatus swells up to such a degree that the walls almost touch each other, so that the tympanum cannot be seen, not even after a thorough cleansing, nor by the aid of the best light.

The examination with the speculum is exceedingly painful, and when attempted produces hæmorrhage, which still more obscures the parts and counteracts the little benefit that might otherwise be derived from it, and therefore may be entirely omitted.

In cachectic, and especially in scrofulous children, otorrhœa easily becomes chronic. It is often absent for months in the warm season of the year, and returns in winter with renewed severity.

Sometimes the secretion is a glairy mucus, sometimes again purulent, and usually erodes the lobe of the ear. The mucous membrane is less infiltrated than in the acute form, but, when the disease has existed for a long time, polypoid excrescences will form upon it, causing a decided aggravation of the deafness.

A chronic otorrhœa can never be regarded as cured, even when the discharge has stopped completely, so long as no cerumen, but a cheesy, smeary, fetid mass is found deep in the ear. This is always proof that the membrane has not yet assumed its normal function, and that the purulent secretion is but temporarily suspended. So long as the cerumen is not found in considerable quantities, no complete recovery can be assumed to have taken place. Chronic otorrhœa seldom attacks both ears at the same time, and with the same degree of severity, but an alternating condition usually takes place.

The prognosis depends upon the state of the membrane lining the meatus, and upon the constitution of the child. The degree of the swelling of the membrane and of the excoriation, the amount of granulations, the presence of polypoid growths, are all points which enter into the prognosis, which must be favorable or otherwise according to the degree and extent of these complications. In scrofulous children it is likewise very difficult to effect a cure, and the disease returns after every exposure to cold and after every indisposition.

According to *Rau* and *Wilde*, the much-dreaded results, perforation of the tympanum, secondary periostitis, and diseases of the brain, never occur as effects of simple external catarrhal otitis. This view is said to have originated from inaccurate diagnosis, which is certainly by no means inexcusable, from the fact that, notwithstanding repeated injections, the meatus cannot be properly inspected for many weeks, particularly if the swelling be at all severe.

Etiology.—There is an intimate connection, in many children, between affections of the mouth and of the ear, as may, in fact, be readily divined from the anatomical contiguity of the parts.

Thus there are certain children who, at the cutting of every tooth in the first as well as in the second dentition, are attacked by otalgia and an otorrhœa, of a longer or shorter duration. This affection occurs as a sequela of scarlatina and measles extremely often, and is associated with scrofulous eruptions of the head, which extend into the meatus. Generally, the otorrhœa in young atrophic infants is not the simple external form, but the inflammation extends to the middle ear, and will hereafter be described.

Therapeutics.—Simple external otitis terminates favorably even without any treatment, and there is therefore no necessity to torture the patient with the vesicants and pustulating ointments so much in vogue, by which an additional disease is produced without palliating the original one. At first, two or three injections of tepid water, daily, and stuffing the ear with charpie, is all that is requisite. If the pain is intense, causing sleeplessness, one to four drops of laudanum, according to the age of the child, may be given in the evening. Astringent injections in the first days of the discharge are totally useless, and in most instances they cause intense pains and an augmentation of the discharge, on account of which it is best to confine the treatment for the first eight days to injections of simple warm water. Of all the astringents, I consider a solution of alum (ʒ j to water ℥ j) the best and simplest, a few drops of which are dropped into the ear morning and evening, after the ear has been syringed with warm water and wiped dry. This solution is as efficacious an astringent as nitrate of silver, and has the important advantage that it neither stains the linen nor discolors the skin. After several weeks the discharge ceases entirely. If no cerumen appears, a few drops of cod-liver oil with iodine (gr. j to ℥ j) should be dropped into the ear. This will cause some itching for a time, and will be followed by a return of the normal secretion. In scrofulous children, a general treatment with cod-liver oil, iron, baths, gymnastics, etc., may always be instituted with advantage, as will be more minutely discussed in the chapter on scrofula.

(3.) Abscesses in the Meatus (*Otitis Externa Phlegmonosa*).—The symptoms of phlegmonous otitis, with suppuration, are much more violent than those of the previous form. Abscesses can only occur in the anterior and easily-accessible parts; for only this, the cartilaginous portion, contains a layer of cellular tissue, while, in the osseous, the periosteum and lining membrane are intimately united. The pain, at first, is bearable, and nothing but a general redness and slight tumefaction are observed; but, after twenty-four to forty-eight hours, the pain becomes aggravated to an excruciating intensity; the child cries night and day without ceasing, is unable to sleep, and every motion of the lower jaw increases the pain. On this account these patients speak indistinctly, and swallow with the utmost caution. Even young infants, but a few months old, are liable to be attacked by this affection, and indicate to their attendants the site of the disease by frequently pulling at the ear. After these pains have continued for two or three days with uniform severity, they then become throbbing, and can only be alleviated by comparatively large doses of morphine. The meatus, in the mean time, has become completely closed by swelling, and, if examined with a probe, it will be found that the swelling is not uniform, but that one part of the meatus, generally the lower, is elevated into a small fluctuating abscess of the size of a pea. A few drops of pus and blood escape when this abscess is opened, or when it bursts spontaneously, and the pain then instantly subsides, but the little abscess still suppurates for a few days, then becomes completely closed, the adjacent redness and swelling also decline, and the whole disease in a few days entirely disappears, leaving scarcely a trace behind.

I am not aware of any positively certain cause for it. Abscesses of the ear occur as well in healthy as in scrofulous children, but are especially frequent in children who are teething. The prognosis is extremely favorable, a fact that does not always seem probable to the less experienced, on account of the violent symptoms which usher in the affection. Induration or ulceration, with exfoliation of the cartilage and bones, scarcely ever ensues. Periostitis of the external meatus is very rare in young children; on the other hand, however, there are several diseases following, and frequently due to periostitis of the middle ear.

Therapeutics.—The principal object is the speedy mitigation of the extremely torturing pains, which may be accomplished by a cautious administration of opium or morphine, they being the most efficient remedies. It is also very important that the patients should use a firm horse-hair pillow, by means of which the internal ear is less liable to be compressed. Topically, it is best to inject warm water, and conduct the steam from hot chamomile-tea upon the abscess. The application of poultices invariably causes pain, and they do not perceptibly promote suppuration. The only means by which we can afford the patient immediate relief is to open the abscess as early as possible, for which a simple incision suffices. The injections of tepid water should then be continued for a few days, when the whole difficulty will entirely disappear.

(4.) INFLAMMATION OF THE MIDDLE EAR (*Otitis Interna*).—In inflammation of the middle ear, either that of the mucous membrane alone, or, conjointly with it, of the periosteum and bone, may occur, and, for this reason, we have to discriminate between (1) a catarrhus and (2) a periostitis auris mediæ.

(a.) *Catarrhus Auris Mediæ.*—This disease must be regarded as the most frequent cause of the deafness which attends inflammation of the ear, and because it usually occurs in both ears at the same time. The catarrh is probably propagated from the Eustachian tube to the tympanum, and the mucous membrane of the tympanum, when once inflamed, behaves like other chronically-affected mucous membranes. Hence we see improvement, soon followed by exacerbations. These children suffer most from deafness in damp weather, or when affected with cold. After hawking, sneezing, or vomiting, tolerably good hearing suddenly ensues, but, after a few hours, again disappears.

The diagnosis of catarrh of the tympanum in children cannot be as accurately made out as in adults, for the former do not willingly submit to have the Eustachian tube explored. Hence the air-douche, the chief diagnostic test in the disease, cannot be obtained. The inspection of the external meatus, by the aid of a speculum, furnishes negative results, as nothing abnormal can be discovered by it, nor do the feeble changes in the color of the tympanum, upon which some aurists place great value, supply any sufficient diagnostic information. In fact, the principal symptom is a deafness or hardness of hearing, changeable with the weather, and combined with catarrh of the mouth and nose, and a negative state of the external meatus.

The termination is usually a sad one, as good hearing seldom returns in any case of chronic catarrh of the middle ear. The patients, therefore, should be content, if the disease do not become more and more aggravated, and terminate in total deafness. In most instances, the cause is inherited scrofulous cachexia, which, in these children, predisposes to hardness of hearing, and is much less liable to become localized upon other parts, such as the eyes, nose, and skin.

Treatment.—The local treatment should be restricted to the extirpation of the hypertrophied tonsils, abscission of the elongated uvula, and inflations of powdered alum into the fauces, because, as has been already stated, in children, the catheterism of the Eustachian tube and the air-douche can seldom readily be applied. I have treated three cases by keeping up a constant pustular eruption alternately behind the ears and on different parts of the neck, with very good results. I have been led to adopt this treatment from the fact that most of these children, suffering from partial deafness, are more or less scrofulous; and I have also repeatedly observed that they are but seldom, and in a very slight degree, troubled with cutaneous eruptions, and derive benefit from this treatment. Two of the cases above referred to, as treated in this manner, recovered their previous good hearing almost perfectly, and, although the third is not much improved, still the symptoms exhibit no special aggravations. I am in the habit of employing:

℞. Empltr. adhæsiv. flav., ℈iv,
Tartar. stibiat. . . . ℈j,

which is smeared upon a piece of linen, of the size of a silver dollar, and allowed to lie upon the skin for four days, when the spot will be found to be covered with bloody pustules, which are not disposed to heal, but will suppurate for many days. As soon, however, as these have healed, the same process may be repeated on another place.

These children should also be guarded against catarrhs, which is best accomplished by inuring them to the changes of the temperature by the daily cold bath and country air. A general treatment, with iron and cod-liver oil, is also indicated by the scrofulous complication.

(b.) *Inflammation of the Periosteum of the Middle Ear—Periostitis—the Real Otitis Interna.*—Periostitis of the middle ear is the most important and dangerous of all the diseases of the ear, for it not only produces the most intense pains, and most frequently leads to total deafness, but life is also endangered by purulent meningitis of the most intense form, which is apt to supervene. For that reason, also, has it attracted the universal attention of aurists, and its symptoms and terminations are much more minutely described than any other disease of the ear.

Symptoms.—In children the disease almost always begins suddenly, and, fortunately, attacks but one ear, never both at the same time. A rapidly-increasing, boring, lancinating pain comes on in the affected ear, which radiates over the adjacent parts, the temple, back of the head, neck, and jaws, and, in a very short time, becomes so intense as to almost drive the child to distraction. It screams and cries incessantly, and cannot be tranquillized in any manner. Toward evening the pains reach their utmost intensity; they are also aggravated by all movements of the lower jaw, and of the head generally, by swallowing, sneezing, coughing, and particularly by loud noises. Nevertheless, the increased irritability of the nerve of hearing, which manifests itself by greater sensibility to noise, and by constant buzzing in the ears, subsides very soon, and is succeeded by more or less complete deafness. These violent local symptoms, as might be supposed, are not unattended by reflex action upon the general system. Violent fever, very frequent and hard pulse, general *malaise*, cold sweats, and great thirst supervene.

In nurslings, all the symptoms just enumerated cannot always be elicited. They are extremely restless, cry at every noise that is made, frequently pull at their ears, and, when at last they have fallen asleep, will wake at the slightest noise with a cry of pain, and incessantly rub the head to and fro upon the pillow. Pressure upon the affected ear also gives rise to the loudest outcries of pain. When put to the breast, they will suck at it only for a short time, and break off with a cry, because the act of sucking aggravates the pain, and, on the other hand, drinks administered by a spoon are swallowed with avidity. Like all other pains and febrile diseases, so is also this condition capable of causing partial or general convulsions, and then it is very liable to be confounded with other cerebral affections.

The examination of the external ear in the first days of the disease furnishes no positive results, and, besides, is extremely painful, particularly when the speculum is used.

These painful phenomena never last longer than five, or at the utmost six days. But, before the expiration of this time, death, in exceptional cases, may take place by convulsions, or under meningitic phenomena. An actual simple resolution of the inflammation, attended by a subsidence of the pains, may indeed also occur, but in this case there is always a suspicion of a diagnostic error. In most instances, the inflammatory pus and the deposited purulent exudation tunnel a passage outwardly in various directions.

The most frequent termination is by perforation of the tympanum, followed by discharge of bloody-streaked, highly-pungent pus. The small bones of the ear, and some pieces of necrosed bone, may escape, followed finally by the cure of the periostitis, with complete deafness of the affected side. Still, it also happens that the small bones of the ear are not discharged, that the perforated tympanum, after the pus escapes, closes up again, and then a slight hardness of hearing only remains.

Some solitary cases are recorded where the pus escaped through the Eustachian tube. They seem, however, to occur but very rarely, and cannot be demonstrated in children, who swallow the pus, not understanding how to remove it by hawking.

Another way in which the pus frequently escapes is into the cells of the mastoid process. An œdematous redness is then observed behind the auricle, the red spot bulges up more and more, fluctuates distinctly, and ultimately, if left to itself, will open. The copious bloody pus which escapes at first likewise has a pungent odor, and carries off with it some particles of bone, and, after a few weeks, becomes mucous and shreddy. If the abscess is explored with a probe, a few exposed spots of rough, denuded bone will almost always be detected; sometimes, however, this is impossible, owing to the curved or angular course of the cavity. The pus is so rich in sulphuretted hydrogen and sulphuret of ammonia, that the silver probe quickly becomes discolored. Ultimately, the fistulous track closes, but not till after many months, and even years, and the contracted cutaneous cicatrix remains consolidated with the bones. Deafness is the most usual termination, and, in the rarer favorable instances, deafness of a lesser degree simply results. When the caries extends to the Fallopian canal, convulsions will take place, and subsequently paralysis of the facial nerve, which runs through this passage. This paralysis is not permanent in all cases; it may disappear again soon after the pus that has exercised the pressure escapes, but, when it has lasted for several months, as a rule, it will be permanent.

The worst event to be dreaded here is the involvement of the labyrinth, and necrosis of the petrous portion of the temporal bone, with consecutive purulent meningitis and encephalitis. The purulent collections in the brain usually communicate with those in the internal ear, and, when the tympanum becomes perforated, may even escape outwardly. But abscesses also occur in the brain without the petrous bone being markedly affected, thus proving that otitis interna, aside from producing a direct mechanical propagation, is also capable of bringing about a concentric cerebritis. These cerebral complications invariably terminate fatally.

Prognostically, the perforation of the tympanum, with discharge of the matter outwardly, when the extremely doubtful resolution is excluded, may be looked upon as a favorable termination, especially if the rare and fortunate event occur of the bones of the internal ear being retained, and the tympanum closing up again.

Much less hopeful and promising is the result in caries of the mastoid process, whereby the deafness usually becomes more marked, the fistulæ remain open for years, and painful contracting cicatrices form. In caries of the petrous portion of the temporal bone, which manifests itself by grave meningitic symptoms, by unilateral convulsions, and, subsequently, paralysis, the prognosis may generally be regarded as fatal. In general, it may be assumed that the children who suffer from otitis interna are scrofulous to a high degree, and that, therefore, tuberculosis of the lung will, with great probability, ensue after the appearance of puberty.

Etiology.—Scrofulosis and tuberculosis furnish the chief predisposing causes of this affection. It either alternates with scrofulous exanthemata, the disease localizing itself, immediately after their rapid desiccation, in the internal ear, without any simultaneous external otorrhœa, or a similarly scrofulous purulent discharge from the meatus auditorius finally causes perforation of the tympanum, and thus gains entrance into the middle ear. This affection also supervenes upon an acute exanthema, and particularly scarlatina. The exciting causes deserving to be mentioned are, foreign bodies in the external ear, those that irritate the tympanum, such as chemical corrosive liquids, which intentionally, with criminal intent, or accidentally, have been poured into the ear, and, lastly, violent injuries and blows in the region of the ear.

Treatment.—The extraordinary severity of the pain at the commencement of the disease induces the relations of the child to covet as speedy a relief as possible, which, however, cannot be satisfied in most instances as rapidly as is desired. The most effectual of all pain-assuaging remedies, opium, ought not to be given to infants, especially to those who have not passed the first dentition, because sopor, followed by cerebral irritation, may be produced, and thus the effects of the opium, and the morbid process which is being propagated to the brain, will not be distinguishable. Cautious experiments with opium may, it is true, be instituted, even in young children, for these dreadful consecutive effects do not ensue in all cases; but we have to limit ourselves to such small doses, that the desired pain-assuaging effects have not usually been realized.

Much better effects have been obtained, in young children, from bitter-almond water and extract of belladonna. Topical abstraction of blood, whose pain-alleviating effects certainly cannot be denied, should be very sparingly practised, as almost all children affected by this disease are scrofulous, and have already been sufficiently reduced by the pain and fever attending it.

Leeches should never be applied in greater numbers than the number of years of the child's age. General abstraction of blood should be avoided entirely.

Most children tolerate nothing in the external meatus nor upon the auricle, and the pain is best borne when the ear is entirely free, and not in contact with any thing. If, in a few days, the pains become throbbing, and the parts in the vicinity of the mastoid process reddened, warm vapors of chamomile-tea may be advantageously conducted into the meatus, and the parts behind the ear may be poulticed. As soon as the pus bursts through the tympanum, or externally through the mastoid process, all pain suddenly ceases, and it is now principally a question of properly keeping up the discharge. For this purpose it is absolutely necessary to provide the relatives with a good metallic (not glass) syringe, and to instruct them thoroughly in its use. Injections of warm water, regularly repeated every two or three hours, afford the only guarantee that the matter escapes without pain and without interruption. The meatus should never be wiped out with the twisted corner of a pocket-handkerchief, for the greatest amount of irritation is produced by the practice, and it should be entirely discarded. But, if it is totally impossible to remove the secretion, crusts will form, especially on the mastoid process; the pus is then prevented from escaping, and increased pain will be the result. In this case, the use of sweet-oil may be of some benefit. If the inflammatory stadium has already expired, astringent injections may be commenced, and a solution of alum (ʒ j to water ℥ j) will be found to answer the purpose best. In caries of the mastoid process, *Rau* recommends a solution of sulphate of copper (gr. ii—xii to water ℥ j) to be injected into the cancelli of the bone.

Internally, during the inflammatory stage, up to the bursting of the abscess, small doses of calomel are generally given, by which the bowels are kept open, and the intensity of fever diminished. The termination in suppuration, however, is not by any means prevented by it. The children subsequently require a tonic and anti-scrofulous treatment, with cod-liver oil, iron, cinchona, ale, wine, meat diet, sea-baths, and country air, etc.

Referring the student, for descriptions of the rarer forms of inflammation of the *internal ear*, and of otalgia and nervous deafness, to the special works of *Rau*, *Kramer*, and *Erhardt*, we will now proceed to make a few remarks upon—

(5.) Foreign Bodies in the Ear.—There is a great natural propensity in the child—proceeding, perhaps, from curiosity—to perform various experiments on its body, and to examine more minutely the cavities which open upon its surface. Hence the particular disposition to push small objects into the apertures, and then to await their effects. In most instances the objects pushed into the meatus are readily recognized when a ray of sunlight is allowed to fall upon them; but, when tumefaction, as a result of irritation, has already supervened, the examination will be much more difficult. Probes should only be used with the utmost caution, for with them the extraneous bodies are readily thrust still farther in.

The symptoms which are induced by a foreign body in the ear vary very much according to its nature and form. Smooth, round objects, which do not swell up in the ear, often produce no symptoms at all for a long time, but, when rough, long, or swollen, the meatus always suffers, and painful otorrhœa ensues. The tympanum is liable to be perforated by the otorrhœa, and in particular by the unsuccessful attempts at extraction, and all the symptoms of otitis interna, described in the preceding section, are renewed. The objects most frequently introduced are: cherry-stones, grape-seeds, peas, beans, lentils, pebbles, glass beads, balls of paper, and pieces of confectionary. The lumps of indurated cerumen, cotton, wool, and filth, and concretions, the so-called otolithes, so frequently met with in aged people, are scarcely ever observed in children. Living animalcula, it is true, at first produce very unpleasant sensations; soon, however, they adhere to the cerumen, and perish quickly, or may be killed by a few drops of water or diluted spirits of wine. The ear-worm (forficula auricula), so much dreaded by people, occasions no special danger, but behaves in the ear in as harmless a manner as all other living animalcula of that calibre.

The most serious symptoms are those occasioned by corrosive substances, nitrate of silver, caustic potassa, and the mineral acids, by which the tympanum is destroyed in a very short time, and the whole train of terrible symptoms of otitis interna is set going. Of all the extraneous non-corrosive substances, those of an organic character are the worst; the moisture and warmth of the meatus cause them to swell up; this is especially applicable to peas, beans, and lentils; in a lesser degree also to all fruit-kernels. Small pebbles and glass beads are tolerated for a long time without any serious effects, if they have not been too firmly wedged in by forcible attempts at extraction. The condition is most favorable in confectionary articles; they soon soften and liquefy, a result much accelerated by a few drops of water.

Treatment.—The only and chief indication, the removal of the foreign body, cannot always be quickly enough carried out, for the tumefaction of the meatus and pain often render this impossible. These symptoms should first be palliated by leeches, cataplasms, dropping in of oil, and injections with warm water. There are various methods of removing the foreign substance, some of which, however, are laborious and adventurous. The forcible injection of a stream of tepid water is undoubtedly the safest and simplest means of setting it afloat. It is hardly ever of precisely the same form as the meatus; the water, therefore, gets behind it, and gradually sets it afloat, and it soon after makes its appearance at the verge of the meatus, and can thence easily be picked out. If this measure has failed to remove it, we may resort to elevators. These may be made at any time, by bending the blunt end of a fine hair-pin toward the flat surface. The end, thus curved, is carefully insinuated behind the foreign body, which is easily brought out. In desperate cases, small blunt hooks may also be resorted to; these should be introduced flat-wise, and then turned so as to come against the object from behind. The utmost caution, however, should be exercised in their use, for the points of the hook may break off, and, if the patient is at all restless, the tympanum is liable to be ruptured. Forceps, if the bodies are round, such as peas, beans, pebbles, beads, etc., are totally useless and even injurious, for two branches require more space than the foreign body, in order to embrace it at its largest diameter, and therefore rarely grasp it. They almost always slip off, and thereby push the article still farther inward.

A third method, which, to be sure, is very mild, as well as often ineffectual, consists in extraction by the aid of some tenacious substance which has previously been brought in connection with the extraneous substance. For this purpose, a quill, cut off smooth at both ends, is introduced into the ear, and through this a piece of tape soaked in glue pushed down upon the foreign body. After a few hours the tape will be found to adhere pretty firmly to the article, and then it is sometimes very successfully and agreeably pulled out. But, when the pebbles, etc., are firmly wedged, the piece of tape will come out alone, and the entire procedure will have been a failure.

All these methods of extraction require the utmost tranquillity and steadiness on the part of the patient, which cannot be expected, especially from a child. Hence, chloroform will have to be employed in most cases, and will be found to immensely facilitate the manipulations. Otitis and otorrhœa, which result from this accident, must be treated according to the principles already prescribed, but they also subside, even without any treatment, much more rapidly than the cachectic otorrhœa.

CHAPTER VI.

DISEASES OF THE GENITO-URINARY ORGANS.

A.—*KIDNEY.*

(1.) Malformation of the Kidneys.—The kidneys are never totally absent; even in the most incomplete abortions they may be detected in some form. One kidney only is to be found in some cases, in which condition ***Rokitansky*** makes a distinction between the ***single*** and the ***simple.*** In the former, a single kidney is found at the normal place, to the right or left side of the vertebral column, differing in shape but little from the ordinary kidney, while on the opposite side there is no trace of a gland. The simple kidney, on the other hand, is an abnormal fusion of two kidneys, the most common form of which is the horse-shoe kidney (*ren unguiformis*). In this case two separated glands of normal shape are united at the lower end by means of a flat bridge of renal substance. The more limited this connection becomes, the more distinct the form of the *simple* kidney appears. Finally, also, the two hila fuse together, forming a single hilum on the anterior surface. The simple kidney is always situated lower in the abdomen than the normal gland, and, as a rule, lies in the vicinity of the promontory of the sacrum; seldom, like the single kidney, external to the median line.

Besides this condition, various other minor deviations in form also occur, and in this connection it may be observed that the kidney of the new-born child, in the normal state, has a slightly uneven surface, and is nearer spherical in form than in the adult, and tapers somewhat toward the upper end.

(2.) Uric-Acid Infarction of the New-born (*Infarctus Renalis*).—Uric-acid infarction is a recent discovery, the merit of which is due mainly to *Vernois*, *Engel*, *Schlossberger*, *Virchow*, *Hessling*, and *Martin*, of Berlin. The infarction manifests itself in sharply-defined, golden-yellow streaks in the pyramids. These streaks run together concentrically in the papillæ, and for that reason are also found thicker there. Under the microscope they are recognized as small cylindrical columns, which, on being strongly compressed, crumble down, and a reddish powder appears, consisting of amorphous lithates, epithelium from the straight urinary tubules, and small rhomboid crystals of uric acid. When these golden-yellow streaks are found in the papillæ, some of them will also be seen precipitated as a carmine-red powder in the pelvis of the kidney, and in the most dependent part of the bladder.

Urinary infarction is met with in two-thirds of all the children who die before the tenth and after the second day of life. It is very rarely seen in still-born, and but seldom in children who have respired one day. On the other hand, however, it frequently exists longer than after the tenth day, and, exceptionally, is even found in children who have lived for more than four or even six weeks.

That this is not a pathological, but a physiological condition, is manifest from its frequency, from the absence of all morbid signs during life, and from the fact that the condition is almost invariably found in children dying before a certain age from other diseases. This phenomenon, according to *Virchow*, is very easily explained in the following manner: Immediately after birth, a more rapid oxidation of the tissues, in consequence of the processes of respiration, takes place, as a result of which, among other products, uric acid is formed. This substance, combined with the alkaline bases, is excreted by the kidneys, but as yet does not find the requisite quantity of water in the new-born child to produce its solution. The large quantities of the excreted urates then accumulate in the straight tubules, and appear yellow, for they are combined with the coloring matter of the urine. The urine, which subsequently is excreted in larger quantities, and is consequently more diluted, partly dissolves it, partly washes it onward into the bladder, and thence outwardly. A red powder, in fact, is now and then found in the diapers of most of the new-born children, which, on close examination, is seen to be uric-acid infarction. This explanation, it is true, is not adaptable to the extremely rare occurrence of lithic-acid infarction in the still-born, and therefore it is evident that it is not completely exhaustive. Although uric-acid infarction is to be looked upon as an undoubted physiological phenomenon, nevertheless it also furnishes causes for pathological conditions; for example, it may give rise to the frequent passage of gravel, and nuclei for the formation of calculi. In truth, the germ of calculi in children always consists of lithic acid.

Lithic-acid infarction, regarded from a medico-legal point, is not devoid of importance, for it is as positive a proof of life as the dilatation of the lungs by air, and has the additional advantage over this sign that it does not become changed so quickly with commencing putrescence. Aside from this, it has only an anatomo-pathological interest.

(3.) MORBUS BRIGHTII (Bright's Disease of the Kidney).—In children, Bright's disease occurs in the acute form almost exclusively, and only as a sequela of scarlatina. The chronic form is very rare, as I infer from the fact that I have met with it only once—that single instance presented in a tuberculous boy ten years of age. It differs in no respect from the disease as it occurs in adults, and we may therefore refer the student to the latest text-books, and particularly to *Frerichs's* monograph, a model of exhaustive scientific essaying.

We confine ourselves to a more detailed consideration of the acute form.

Pathological Anatomy.—The kidneys usually exhibit those morbid alterations which *Frerichs* ascribed to the end of the first or commencement of the second stage. They are perceptibly enlarged, generally in consequence of an increase in bulk of the cortical substance, which is of dark-red color, brittle, and friable. The cut surfaces are very moist, and, on scraping them with a knife, a tenacious, bloody serum is obtained. Small extravasations of blood, of the size of a pin's head, are also frequently found. The pyramids are much less altered, and reveal nothing more than a greater vascular turgescence, which produces a general dark color.

The enlargement of the kidney is due to an exudation of fibrin, which fills up the tubuli contorti, and may be microscopically demonstrated in the fluid scraped from the cut surfaces. Numerous Bright's casts can be seen under the microscope, which are sometimes clear hyaline, sometimes again still surrounded by epithelium-cells, and perceptibly contain blood-corpuscles. These casts, though in much less quantity, are also met with in the tubuli recti, and are never totally absent from the precipitate of albuminous urine. When these children succumb at the very commencement of the disease, the urine will be found to contain so many blood-corpuscles as to color it dark red. After some time, it is clear, yellow, or turbid; the blood-corpuscles and coloring matter of the blood have disappeared, but albumen and casts may still be detected. At this stage of the case the cortical substance exhibits more the character of the second stadium, according to *Frerichs's* division.

It loses its dark color, and at first becomes pale yellow at various points, and finally all over. The blood-corpuscles in the plugged-up capillaries disintegrate, and are then, together with the coloring matter, absorbed, or washed onward; the exudation within the urinary tubuli likewise undergoes a retrograde formation, and the casts degenerate into fat molecules, and, although they still loosely retain their normal form, lose it when pressed by the glass cover under the microscope, consequently it is not always practicable to use it in the microscopical examinations at this stage.

The kidney remains increased in bulk, and very brittle, the capsule may be pulled off with ease, and the upper surface is then seen to be slightly granular. This slight unevenness arises from the metamorphosis of the fat, and the succeeding atrophy, which does not progress uniformly on all parts of the cortical substance. While one part is already flabby, and begins to waste, the other is firm with exudation, and occupies its former large space.

In acute cases there is only found a very small quantity of urine in the bladder; in children who survived for many weeks after the attack, it may have returned to its former normal amount.

Dropsical effusions into the peritoneal sac, pleura, and *pericardium*, are also found in almost all cadavers, often combined with inflammatory exudation, especially upon the pleura. Those morbid alterations of the rest of the organs, which we constantly observe in the chronic form in the adult, do *not* occur in children.

Symptoms.—The first signs of disease of the kidney usually appear at a time when the desquamation is at its acme, at the end of the third week of the scarlatina. The child who, to all appearances, is already perfectly well, and has a good appetite, suddenly loses it. It is seized with nausea and vomiting, and fever and debility again come on. The face, at the same time, assumes a puffed appearance; the integument of the lower eyelids becomes elevated into glistening sacs, and, in a few hours, the entire surface of the body is affected by anasarca. Simultaneously with these phenomena, a palpable diminution of the secretion of the urine is observed. In the most acute form, the child will pass no urine at all for more than twenty-four hours, and finally void a few drops of blood-colored, concentrated urine, the act being attended by severe pains. In many cases, however, the urine is not very much diminished, nor bloody, but of a pale-yellow tint, or pellucid, so that, on merely inspecting it, no alteration whatever can be detected. There is often also very sharp pain in the lumbar region.

The chemical and microscopical changes of the urine are the same as in Bright's disease in the adult. In the first few days the quantity of albumen, when no great amount of blood is admixed, is less than it is subsequently, and varies between ten and thirty pro mille. An approximative estimation of the daily loss of albumen may be formed by boiling a certain quantity of urine in a graduated test-tube, and allowing the coagulated albumen to settle for twenty-four hours. If the total amount of the daily discharge of urine is known, then it is easy to calculate how many cubic centimetres of albumen are voided in the urine. In children, however, the collection of the urine passed in the entire twenty-four hours is attended by considerable difficulty, and often entirely impossible, for they always discharge the urine along with the stools.

The casts are found with the greatest certainty, and in largest quantities, when urine that has been voided some hours previously is slowly decanted, and the residue poured into a tall champagne-glass. In this glass the urine is again allowed to stand quietly for several hours, when all but a few drops are poured off, and these last remaining drops are examined by the microscope. If no casts are found in urine thus prepared, it may be safely concluded that none exist. In all cases of acute Bright's disease, however, they are seen closely pressed together, and lying over each other, and, by examining and comparing a large number of these structures, we obtain a true insight into the nature of the entire disease. The casts possess different qualities, according to the duration of the disease, as already described in the pathological anatomy.

The quantity of urine is generally lessened, the salts are likewise diminished, but the coloring matter in most cases is augmented. In the course of the disease, however, the urine again resumes its former straw-yellow color. The turbidness and sediments which are frequently present are partly due to the large quantities of casts, partly to the numerous epithelium-cells, and urinary salts.

Should albuminous urine continue to be discharged for several days, the anasarca will increase, and the signs of dropsical effusions into the cavities of the body will become superadded. The abdomen becomes more and more protuberant; complete dulness, when percussed in the sitting posture, is obtained over its lower part, and, in the recumbent position, fluctuation is distinctly felt. This, however, may arise from œdema of the abdominal parietes. The symptoms of hydrothorax are still more striking. The greater the serous effusion into the pleural cavities, the more rapidly and laboriously do the children breathe; the flat percussion-sound gradually rises, and only the rhonchi which are propagated through the ribs, and feeble or no respiratory murmurs, can be heard. The hydropericardium, which almost simultaneously appears, makes the pulse irregular, flickering, and small;

the dulness in the præcordial region increases in circumference, but cannot be accurately defined on account of the close contiguity of the hydrothorax. These children sit upright, like croup patients, in their little beds, and sleep, if they are able to sleep, with the head thrown forward. They grasp firmly at the sides of the bed, in order to fix the pectoral muscles, and secure as great a dilatation of the thorax as possible, and, with pitiful, beseeching looks, gaze about them in every direction for help.

In progressive increase of the hydrothorax, the patients may perish from suffocation; and, indeed, also œdema of the glottis, or uræmic symptoms, as a result of the grave renal disease, may supervene. These manifest themselves by headache, loss of vision and hearing, and by stupor and delirium, and death may also be brought about by exhaustion, through persistent vomiting or diarrhœa.

Hardly ever does a transition into the chronic form of Bright's disease occur in scarlatina. The children either die soon under the above-described symptoms, or, after two or three weeks, the albumen in the urine begins to decrease, the urine is passed in larger quantities, the œdema and effusions into the serous sacs disappear, and this is followed by complete recovery. Of this I was once able to convince myself by the autopsy of the body of a child whom half a year previously I had treated for acute Bright's disease, but subsequently lost by a violent typhus fever. The cortical substance of the kidney in this case was neither too large nor too small, and microscopically could in no respect be distinguished from that of the healthy kidney.

All cases of nephritis, which appear with and after scarlatina, do not terminate with dropsy, because death ensues too early. Such are the cases of scarlet fever which rapidly terminate fatally in vomiting, coma, and convulsions, and their unhappy issue is often erroneously ascribed to the severity of the fever, to the premature retrogression of the exanthema, to hydrocephalus acutus, and, still more conveniently, to the intense toxic effects of the contagion. A more accurate investigation of the cortical substance of the kidney, in most of these rapidly-terminating cases, reveals a marked alteration, like that found in the first stage of Bright's disease.

Conversely, however, cases of œdema of the integument, after scarlatina *without* nephritis, or albuminuria, are also met with. This simple anasarca, according to *Frerichs*, is occasioned by exposure to cold during the period of desquamation, and is due to paralysis of the vascular systems of the integument and subcutaneous cellular tissue.

The most contradictory statements exist concerning the occurrence and frequency of nephritis after scarlatina. While some authors maintain that two-thirds and even three-fourths of all scarlet-fever children are affected with it, others, on the contrary, claim that it occurs only once in twenty or thirty cases. The former hold that it is only necessary, in all cases, to thoroughly and accurately examine the urine, while the latter repel this reproach with indignation, and accuse their opponents of the grossest exaggeration. But it is possible for both to be right, for this depends entirely upon the character of the epidemic, and not upon the intensity of the disease. In some epidemics almost all scarlet-fever patients become dropsical, in others barely a few.

Of one hundred scarlet-fever patients, dropsy was observed by *Haidenhain* in eighty per ct.; by *James Miller*, in twenty-seven per ct.; by *Wood*, of Edinburgh, in twelve and a half per ct.; by *Rösch*, in ten per ct.; and by *Frerichs*, in four per ct. of the cases.

For a number of years back, scarlet fever has been prevailing endemically in Munich, but is only feebly contagious, and I have treated at least between fifty and sixty cases, and but twice only, and that temporarily, observed albuminuria.

Treatment.—In this disease the physician renders the most effective service by vigilant prophylaxis. The locality in which the patient is confined should be carefully tested for the state of the temperature, draught, and dampness, and that room should be preferred which can be properly warmed and ventilated, in which no unpleasant draught occurs from the opening of doors, and the walls of which are dry. Inunctions of fat, on account of the well-known properties they possess of rendering the skin less susceptible to changes of temperature, are to be employed, even if they do not afford the degree of protection which *Schneemann* ascribes to them.

This *régime* is to be continued till the desquamation is entirely over, and the child, by a few baths, has again been habituated to greater changes of temperature.

When dropsy and albuminuria have once appeared, the best means should be adopted to relieve the stasis in the kidney, by stimulating other secretions, such as the skin and bowels. Calomel, castor-oil, and subsequently also senna, are, by preference, selected from the class of aperients. Jalap and colocynth, and the salines, are with justice avoided, because the salts are in greater part absorbed, and then eliminated by the kidneys. In children who are at all predisposed to diarrhœa, the utmost possible care must be exercised, otherwise a fatal enteritis may be produced. An effort should be made to stimulate the secretion of the skin—which, in anasarca, is much diminished—by small doses of tartar. stibiat., or, when the children are very restless, by small doses of opium or camphor. The main attention is always to be directed to the secretion of the urine. If this is properly reëstablished, almost all the children, with good care and nursing, will recover, but, if it remains suppressed, diuretics should be employed to stimulate it. The best diuretic, the only one that is unattended by any unpleasant consecutive effects, and which can be given for a long time without disturbing the digestion, is roob juniperi, as fresh as possible. Children take it most readily when it is sweetened and diluted with a little water. Its dose is two or three teaspoonfuls in the twenty-four hours. I have often already convinced myself of the palpable good effects of this remedy, and in children prefer it to digitalis, bitartrate or acetate of potassa.

Threatening uræmia must be relieved by vegetable acids and alkaline baths. For profuse diarrhœa, plumbi acetas, daily two or three grains, combined with opium, has proved to be most effectual. In case the œdema and albuminuria should not have disappeared in three or four weeks, as it generally does, a tonic treatment with tannin, cinchona, and the preparations of iron, is then indicated. For the remaining anæmia, the administration of wholesome, easily-digestible food, and the enjoyment of fresh country air, will answer the purpose satisfactorily.

(4.) Renal Calculi, Renal Tubercles, Renal Cysts.—Although concretions in the uropoëtic system of children are of frequent occurrence, and have their foundation in the physiological lithic-acid infarction already described, still stones of larger dimensions very rarely form, at least such as would give rise to more decided symptoms. In these cases there are very generally present severe renal pains, a purulent sediment in the urine, and the passing of small concretions, attended by violent pains in the course of the ureters and urethra. The pus in the urine is due to secondary inflammation of the pelvis of the kidney, and of the irritated mucous membrane of the ureters and of the bladder.

The treatment consists essentially in allowing the children to drink as much water as possible, for thereby the existing concretions, on the one hand, are more readily washed along, and, on the other, diluted urine must tend to diminish the gravel rather than to promote its deposits. When large ulcerations have formed in the pelvis of the kidney, fever will supervene, which quickly assumes a hectic character, and is soon followed by death; or the affected kidney may totally disappear, leaving the opposite one to perform a double duty.

Renal tubercle occurs in two forms. In one case the kidney is simultaneously attacked with the rest of the parenchymatous organs, by miliary tuberculosis, which scarcely produces any renal symptoms at all, and is only discovered in the cadaver. In the other, the tuberculosis in boys is more of a local nature, and extends upward from a tuberculous testicle, first to the mucous membrane of the bladder, and then to that of the ureters, and finally also to the kidneys. In this case a considerable portion of the kidney may be encroached upon by a large yellow, cheesy tubercle, and become excessively hypertrophied, the upper surface thereby assuming an uneven, nodular appearance. Suppuration, and degeneration even, occurs in the yellow tubercle, by which finally the tuberculous renal cavities, and ultimately phthisis of the kidney, are produced. The treatment of renal tuberculosis is very hopeless, and must be confined entirely to the improving of the constitution by tonics and cod-liver oil.

Cystic formations are very common in the kidneys, and are even met with as congenital conditions. Obstetric cases are recorded in which the abdomen had become so distended by fœtal cystic formations in both kidneys, that it presented an impediment in the delivery. Simple cysts, of the size of a hemp-seed up to that of a cherry, are very frequently found in the most varying autopsies. They are always situated very superficially in the cortical substance, and most of them are filled with a clear, pellucid, thin serum. The chemical investigation of this serum reveals the presence of a slight amount of albumen, and only exceptionally of those chemical substances which characterize the urine, such as urates and lithic acid. It is generally assumed that they are caused by an occlusion of some urinary tubules by uric-acid infarction, subsequently also by calcareous concretions, extravasations, and exudative casts. The acephalo-cystic sac and the composite cystoides are extraordinarily rare in the kidneys of children, and their consideration may therefore very properly be omitted.

B.—*BLADDER.*

(1.) MALFORMATION.—(a.) *Total absence of the bladder* is an extremely rare occurrence, and is always combined with malformations of other organs. The ureters terminate in the navel, the rectum, or vagina. The following condition is more frequently observed:

(b.) *Fissure of the Bladder, Prolapsus, s. Extroversio, s. Defectus, s. Ectopia, Inversio Vesicæ Urinariæ.* We understand by all these denominations a defect of the anterior wall of the bladder, and of the corresponding portion of the abdominal parietes, so that the posterior wall of the bladder lies freely exposed (Pl. III., Fig. 10).

Two forms, a *total* and a *partial*, are distinguished. In the first the abdominal fissure extends from the navel to the pubis and genitals. In the second, a well-formed navel, normal genitals, and only a small opening in the anterior abdominal parietes, exist. A highly-red chasm, of the size of a silver dollar or more, is found in the new-born child in the region of the bladder, which is bounded by a sharp cutaneous ring. This red gap is only filled up after birth by the posterior wall of the bladder becoming invaginated in it through the action of the abdominal pressure during crying and defecation, appearing as a fleshy, soft, fluctuating tumor. This tumor is constantly moist and tenacious, and presents at each side, in its lower part, two small elevations, which correspond to the place where the two ureters terminate, and are most distinctly recognized when the tumor is displaced a little upward. On closer examination the urine will be seen to ooze out in drops from these points, emitting its characteristic ammoniacal odor.

After several years, the cutaneous ring, by increasing granulations, grows somewhat over the prolapsus, and thus diminishes the exposed surface of the mucous membrane of the bladder; but a large portion of its posterior wall nevertheless remains uncovered. After a while the exposed portion loses the character of mucous membrane, and that portion above the ureters becomes dry, callous, and insensible; below them the prolapsus frequently becomes excoriated, in consequence of the incessant flow of the ammoniacal urine over it, and acquires a fungous appearance.

Complete fissure of the bladder always extends into the genitals. The penis is very short, close to the prolapsed bladder, and either totally or partially split. In the latter case, it has the appearance as if split from the urethra upward, so that the urethra is not a closed canal, but represents a trough, fissured on its upper surface. In extensive fissures, an oblong appendix, which is the split penis, hangs on both sides, and the line of division extends into the scrotum, on account of which it may be difficult to discriminate the sex. This discrimination becomes still more difficult, when, as is usually the case, the testes still remain in the abdominal cavity.

Analogous splittings occur in the female sex. The clitoris is divided, the labia majora and minora cloven, and the vagina is often totally absent. The perinæum is extremely short, and the anus is situated directly behind the genitals. It may even be advanced so far anteriorly that it terminates in the posterior wall of the bladder, and the feculent matter may likewise be evacuated by the prolapsed bladder.

When the fissures are thus extensive, the rami of the pubis will be found developed in a rudimentary form only. They either simply terminate in the vicinity of the prolapsus, or are united to each other behind it by a narrow band. The pelvis is very wide in its transverse diameter, but narrow antero-posteriorly. The sacrum and coccyx are very much curved forward, to which are due the shortness of the perinæum and the termination of the rectum far anteriorly.

The effects of this deformity vary according to its extent. In all instances the patients afflicted with it generate a disgusting urinary odor, and suffer from constant excoriations around the openings of the ureters. In fissures of the penis, the highest degree of epispadia, or in imperfect development of the vagina, the individuals are naturally incapable of propagating the species. There is nothing in these deformities incompatible with life, and cases are known where the persons attained to an age of even forty years. Indeed, *Huxham* describes the very remarkable case of a woman who, afflicted with this prolapsus vesicæ congenitus and cloacæ, married in her twenty-third year, conceived, and gave birth to children. The husband of such a creature deserves almost as much admiration as herself.

Numerous hypotheses have been advanced in regard to the origin of ectopia of the bladder. The explanation given by *J. Müller* seems to be the most plausible.

According to this author, the bladder is not formed through the reflection of a lamina, but merely by the gradual dilatation of the pouch, which, with the urachus, is pinched off from the sinus urogenitalis. But the urachus does not originate through the reflection of a lamina, but is only the neck of the allantois, which primarily grew forward from the intestinal canal like a small vesicle. From these two facts *J. Müller* infers that we have not here to deal with an arrest of development, nor with a stopping of the bladder at a former stage of development, but he is rather of the opinion that the absence of the anterior wall of the bladder is due to a rupture of the sac which occurred at a time when the abdominal parietes were not yet completely formed. This rupture must have its foundation in a transient or permanent impermeability of the urethra, by which the urine that is accumulating in the bladder distends it to such an extent that it finally bursts. In this manner there originates an opening between the navel and the external genitals. The simplest form of this malformation is epispadia, escape of urine on the upper surface of the penis or above the pubes, but the ordinary effect is a large opening between the umbilicus and pubic bones.

Treatment.—An operation, having for its object the closing of the defect by freshening the edges, and uniting them by the aid of needles or sutures, is to be entertained only when a permeable urethra exists; but, even where this condition obtains, a very rare one, the hopes of the operation, so far as I know, are invariably disappointed by the irritating effects of the urine, which constantly bathes the raw surfaces of the wound. Our efforts consequently are limited to the preventing and healing of excoriations, by securing the utmost possible cleanliness, and by pencilling the exposed surface with pure oil. When the child grows up, an attempt may be made by *Earl's* apparatus to lessen the disgusting odor. It consists of a hollow silver shield provided with a caoutchouc tube with a stop-cock, and is secured to the prolapsed bladder by a double truss.

C. *Cloacæ.*—Communications between the rectum and bladder have already been spoken of, in connection with malformations of the rectum.

(2.) CATARRH OF THE BLADDER, INFLAMMATION OF THE BLADDER (CYSTITIS).—This is a rare disease in childhood. It occurs as a result only of external injuries, or rough calculi, or from the misuse of cantharidis, and at the close of grave diseases, such as typhus fever, cholera, and small-pox.

Pathological Anatomy.—These causes hardly ever produce more than cystitis mucosa, or catarrh of the mucous membrane. External injuries may, in very rare instances, occasion cystitis serosa, or inflammation of the serous coat of the bladder; or pericystitis, an inflammation of the connective tissue which loosely surrounds the bladder.

The inflamed mucous membrane is deeply injected, and, when the disease has existed for some time, will have a grayish-brown tint, will be thickened, and large quantities of mucus found at the bottom of the bladder; even excoriations of the mucous membrane and diverticulæ are occasionally observed. The most extensive morbid lesions are always seen when calculi having rough surfaces exist.

Symptoms.—In some cases the vesical symptoms may develop themselves very rapidly; for example, in children who are susceptible to cantharidis they may come on within twelve hours after the application of a blister. In calculi, on the contrary, they come on very insidiously, often improve, and then relapse.

Pain and tenderness in the region of the bladder, rectum, and urethra, constant dysuria, voiding of a dark, turbid, and even bloody urine by drops, are the constant symptoms. In the severest grades of the disease—which, however, are never met with in children—there are also observed distention of the bladder, complete ischuria, fever, typhous and peritonitic symptoms, sopor, green vomiting, collapse, cold sweats, etc.

The urine always contains a large quantity of vesical epithelium, mucus, and pus, and, when first passed, it has a wheyish turbidity, but does not clear up completely, even when allowed to stand for a very long time, and precipitates a thick, tenacious sediment. It rapidly decomposes, generates ammonia, and produces a brownish stain even on silver instruments. In diphtheritic cystitis, only observed in badly-ventilated hospitals, and which is complicated with diphtheritis of other mucous membranes, large pieces of false membrane are also voided with the urine, attended by the most excruciating strangury.

The course of cystitis varies very much according to the cause. That form produced by cantharidis passes off most quickly and surely. The urine becomes perfectly clear again in a few hours, is voided without any pains, and the symptoms disappear without leaving a vestige behind. Cystitis at the end of grave diseases lasts longer; still even in this case, when the general recuperative process is active, it terminates after a few weeks in recovery. The prognosis of traumatic cystitis depends upon the severity of the injury, but, in making it, it is well to bear in mind that, by virtue of the greater reproductive powers in childhood, more extensive injuries may be recovered from, and greater deformities remedied in a given time, than in adults.

The case is much worse in cystitis, caused and kept up by a calculus. Even here, it exceptionally happens that the catarrh, notwithstanding the existence of the stone, disappears, a result only probable when the stone is very smooth. Usually, however, the inflammatory symptoms last as long as it remains in the bladder, disappearing totally after it has been removed. Children affected with calculi and catarrh of the bladder do badly, both mentally and bodily; and lithotomy, if the diagnosis is sufficiently clearly established, cannot be too quickly practised, especially since this operation in children is incomparably easier to perform, and less dangerous, than in adults.

Treatment.—The removal of the cause is the most essential part of the treatment. Should a cantharidal vesicant be upon any part of the body, it should be removed instantly. It not very infrequently happens that mild vesicants remain for several days upon the skin without producing any topical inconvenience, and then suddenly vesical pains come on, and the ignorant relatives have not the least idea of the intimate connection between the worthless old plaster and the violent harassing symptoms.

The patients should be ordered to drink as much as possible of almond-milk and emulsions of flax-seed, so as to dilute the urine; and to partake of bland food, such as milk and broths, containing as little salt as possible.

The quantity of urine in the bladder should be carefully controlled, and the hypogastric region often percussed. The catheter should be introduced as soon as any dulness is perceptible, and the urine drawn off. The instrument, however, should never be left in the urethra, for the access of air decidedly aggravates the inflammation.

Thorough evacuation of the bowels should be obtained, but saline aperients must be avoided. Several calomel powders, of a few grains each, render the best service. For the strangury, moist warm cloths, laid upon the hypogastric region, have proved to be very effectual; in sleeplessness, some preparation of opium and bitter-almond water may be prescribed. In chronic cystitis, several grains of tannin may be given daily, or injected into the bladder. Patients with calculus should be operated on under all circumstances.

(3.) ENURESIS, INCONTINENTIA URINÆ, MICTIO INVOLUNTARIA. (The nocturnal micturition in bed.)—Constant dribbling, or an entirely involuntary passage of urine, often occurs in children, and continues till they are several years old; but it is seen only in cases where marked cerebral affections are present, such as idiotism and chronic hydrocephalus. This condition is due to an actual paralysis of the bladder, of which the muscular coat, as well as neck, is involved, thus permitting the continual escape of the urine, though the bladder may contain but a moderate amount. This condition continues incessantly by day and by night, and should be distinguished from the nightly micturition in children otherwise well-developed.

The latter occurs much more frequently in boys than in girls, and in most instances lasts up to the twelfth year of life—in exceptional cases, even till the appearance of puberty. It by no means depends upon great local or cerebral lesions, otherwise it would not regularly terminate in recovery, and would also persist during the day. In this instance an inferior degree of sensibility of the bladder to the irritation of the urine must exist, as a result of which it does not indicate its condition during sleep, or the sleep must be so profound that the ordinary irritation of the urine upon the filled bladder does not rouse the child. The latter view seems to be sustained by the circumstance that many children affirm that they had distinct dreams of sitting upon the chamber and passing their water in the customary manner. They generally pass their urine in bed but once during the night, during the first few hours of sleep. I cannot see that slothfulness, bad habits, or negligence, satisfactorily explain the causes of enuresis nocturna. In most of the cases which I have observed, the children, through their own sense of honor, or on account of repeated punishments, had a lively interest in avoiding the accident, and yet were unable to do this without appropriate treatment pursued for months and even years.

I am likewise unable to confirm the opinion of some authors, that chemical alterations of the urine may be the cause, for chemical investigations of the urine, instituted in three cases of enuresis, taught me that the urine does not in any manner vary from its normal quantitative nor qualitative composition. On the other hand, however, the statement, that most of the children suffering from this misfortune are not particularly blessed with perfect health, is correct, for they usually labor under scrofulous affections of the most varying kind, or under rachitis or helminthia.

The effects of this malady are rather unpleasant, for the psychical development in particular suffers. The repeated punishments which these children undergo blunt their sense of honor considerably; they become cowardly and deceitful, and have no personal spirit. If great and expensive cleanliness is not practised, the bed, and even the whole room, acquires a urinous odor, which contaminates the atmosphere and begets conditions which are by no means favorable to the metamorphosis of the tissues. Such children may be ultimately attacked by indolent ulcers on the nates and lower extremities, the results of the urinous excoriations.

Treatment.—A treatment directed to the removal of the cause may become necessary, when marked symptoms of intestinal worms, of scrofula or nervous hyperæsthesia, become manifest, which must be met with anthelmintics, cod-liver oil, iron, cinchona, and aromatic baths. *Lallemand* praises the latter, in particular, very highly. He allows four or five handfuls of some aromatic species of herbs to stew in a covered vessel, and this decoction, together with a glassful of brandy, to be poured into the bath, which is covered by a cloth, so that the head of the child only is exposed. In this bath the child is to remain from one-quarter to half an hour, and after several baths the quantity of the herbs and of the brandy may be doubled. These baths must be repeated daily or every other day for several weeks, whereupon a recovery ensues.

The dietetic treatment consists in first taking the precaution that the child eats or drinks nothing for several hours before retiring for the night, by which the secretion of urine is reduced to a minimum; and, although it may pass off involuntarily during the night, still the quantity will be very small. It is also advisable to make the patients sleep in the lateral posture, because it has been repeatedly observed that they invariably pass their water while lying upon the back, but remain clean when they sleep on the side. In order to prevent them from rolling over on the back in sleep, it is suggested that a cloth or sheet be tied around the body with a large knot fixed exactly over the spinal column. The pain which it causes, when they attempt to roll over on the back, instantly rouses them.

This advice sounds very simple and plausible, but always fails in its purpose, because children will not tolerate a band around the body, so tight that it would not become displaced through the night.

They urinate in bed as much as ever, notwithstanding the knot, and, when they are raised up, it is found shoved over to one side.

There is no necessity for the physician to advise any psychical or corporeal chastisement. Usually these remedies have already been fruitlessly employed, on the most extensive scale, before he was consulted. Still less are terrifying measures, such as the menace of applying a red-hot iron, suggested by *Boerhaave* and *Caspar*, to be permitted, or recommended, for a very injurious effect may thereby be produced upon the nervous system.

Of the internal remedies, two are especially efficacious, namely, belladonna and nux vomica.

Of the former, one-twelfth to one-sixth of the extract may be given every evening, the dose being increased till the pupils become dilated. By this treatment, the enuresis is arrested for several days, but it usually relapses; yet it is not advisable to continue it for a long time with large doses. In many cases I have derived a much more durable effect from *strychnine nitric.* This preparation is preferable to the ext. nucis vomicæ spirit., for the quantity of strychnine in the latter is by no means always uniform, and the gradual increasing of the dose is, therefore, more apt to be attended by symptoms of poisoning. It is best to give it in powder, simply triturated with a little sugar. Children over three years of age are at first allowed one-thirty-second, then one-twenty-fourth, etc., up to one-eighth of a grain; strong coffee should be prepared and always kept ready at hand in case symptoms of poisoning come on, such as twitching of the muscles, etc., which are most certainly controlled by it. With this treatment, the object aimed at is usually attained in from eight to fourteen days, and generally the cure is also permanent.

The experiment which readily suggests itself, to tie the penis with a piece of tape, and thus prevent the escape of the urine in a purely mechanical manner, is impracticable, for it causes œdema of the penis and erections. A case has occurred where a boy, from fear of the brutal chastisement which he was promised if he wet the bed, tied his penis so tight that he was unable to loosen the knot on the next morning, and the result was partial gangrene and a urethral fistula.

(4.) ISCHURIA. RETENTION OF URINE.—Retention of urine in adults and children is a symptom of the most varying kinds of morbid conditions. Hence we have ischuria paralytica, spastica, inflammatoria, organica, and mechanica. Of all these kinds, but a single one, ischuria spastica, occurs in children. Nervous children, who suffer much from flatulence and colic, will sometimes pass no water for more than twelve hours, on account of which their attendants are thrown into the greatest anxiety. The patients become very restless, cry fearfully, draw up their lower extremities against the abdomen, take the breast but little, and consume a small amount of fluid, but this enables them to pass a long time without urinating. It is not a very serious accident or disease, and I have never yet met with a case where actual mechanical impediments had to be overcome. The only point which may be interesting is, that, in infants a few weeks old, the passage of lithic-acid infarction, in the shape of small, red, sharply-angular grains, may occur.

The *treatment* is extremely simple, for the introduction of a slightly-curved, well-oiled probe will always produce a discharge of urine immediately. To prevent recurrence of the vesical spasms, the application of a bag of chamomile-flowers upon the hypogastric region is very useful. It is, in fact, much more so in children than in adults.

(5.) VESICAL CALCULI, CALCULUS VESICÆ. LITHIASIS (λιθίασις).—Calculary affections are comparatively frequent in boys. Nearly forty per cent. of all the individuals operated on for lithotomy are children under ten years of age, as is seen from the statistical statements of *Prout*, who reported 1,256 cases of lithotomy operated on in the large hospitals of Bristol, Leeds, and Norwich. The reason for this singular circumstance is found (1), in the physiological uric-acid infarction, a few granules of which may readily remain lying in the bladder, and thus form the nucleus of the stone; and (2), in the quantity of the phosphates which occurs in the urine of rachitic children. In rachitis the urine becomes so rich in phosphoric acid and carbonate of lime, that a decided stratum of white powder remains after the evaporation of the urine which these children leave on the floor, a fact to which my attention was once called by an observing nurse.

All kinds of vesical calculi occur in children—the urate, oxalate, and phosphate. The lithic-acid calculi, consisting of this acid and its salts, are moderately hard, smooth, and most of them are yellowish brown in color, because the coloring matter of the urine is almost always precipitated simultaneously with the lithic-acid sediment, and, as a rule, forms the nucleus of the stone, although the external layers have a different chemical composition. Most of the calculi composed of phosphate of lime and triple phosphates are soft, light-colored, of light gravity, and rough on the outer surface. Oxalic-acid calculi, which in children form but very rarely, are the hardest of all, brown in color, and of a rough, nodular surface, on account of which they have also been called mulberry calculi. Calculi composed of cystin and those of carbonate of lime are extremely rare. The first-named calculi may also combine with each other, when the ness, and mobility, may be obtained. The smaller the calculus the more difficult, of course, it is to find it. It is sometimes necessary to examine the patients in different positions, standing, lying on one side or on the other, or on the back, taking care that the bladder be filled or partly filled with urine. In some instances it may be felt by introducing the finger into the rectum. The exploration with the sound in children is seldom successful, and incomplete or impracticable without the aid of chloroform.

The *course* of the disease is almost always the same. It happens only rarely that stones larger than peas pass off by the urethra, and still more seldom that they are evacuated through the vagina, rectum, or perinæum, as a result of ulceration.

If no artificial aid is rendered them, the patients will retain their calculi to the end of life, which, although attended by constant torture, may be protracted for many years. Ultimately they become atrophic, have hectic fever, loss of appetite, exhaustion, and sleeplessness, and perish miserably, or uræmic symptoms and nephritis become superadded, and these are speedily followed by death.

Treatment.—There is only one indication, and that is, the removal of the cause of the disease, the foreign body from the bladder. This has already been tried by the most varying internal remedies, the so-called lithotriptica, and by direct injections into the bladder. The effect, however, of these calculary solvents is still extremely problematical. The waters of various springs are recommended, especially Vichy, Kreuznach, Eger, and Franzenbad. Of the internal remedies may be mentioned the alkaline carbonates, phosphate of ammonia, herba uvæ ursi, electro-magnetism, and weak injections of fluids, which concentrated are certainly capable of dissolving the stone, but in this state cannot, of course, be introduced into the bladder.

The mechanical removal of the stone through the urethra succeeds only in very few instances in the female. The male urethra, on account of its narrowness and length, is unadapted to this method of practice.

We have, therefore, no other resource but its removal by a surgical operation, by lithotomy or lithotripsy. The description of these two methods of operation belongs to the study of surgery, and is found magnificently delineated in *Pitha's* Diseases of the Male Sexual Organs, *Virchow's* Pathology and Therapeutics.

In regard to the choice of the operation, whether lithotomy or lithotripsy should be preferred, it is only necessary to state here that lithotomy is even better adapted to children than to adults. According to the declarations of all experienced surgeons, children furnish an extraordinarily favorable ratio of recovery. The calculi are seldom to each other, or they may be held in juxtaposition by a few serre fines. The hæmorrhage and consecutive œdema are but slight, and the cure is complete in a few days.

(β.) *Congenital Paraphimosis.*—It occurs with and without hypospadia, and is the result of a true arrest of development. The glans, from the earliest period of embryonic life, are not covered by foreskin, are imperforate, and the future meatus urinarius is only indicated by a white spot. Very gradually a fold of integument, the future prepuce, forms behind the corona glandis, rapidly grows forward, and soon covers the whole glans. The urethra in the mean time has become developed. An arrest of this growth, and the coalescence of this rudimentary prepuce with the glans, produce the condition known as paraphimosis congenita, or, strictly speaking, a defectus præputii congenitus. It is frequently combined with hypospadia, and the frænulum, in particular, is often so shortened that, during erection, the meatus is pulled downward. *Von Ammon* has made the remarkable observation that congenital defect of the foreskin not unfrequently occurs in Hebrew boys. It would therefore seem that an artificially-produced defect of form may be inheritable. An analogue of this fact is found in the well-known one that tailless pups are much more frequently born in the races of dogs whose tails it is customary to cut off, than in other races which are not mutilated by this cruel custom.

No therapeutic measures are necessary in this defect of the penis; but, when the frænulum is too short, and during erections drags upon the glans so as to be a source of pain, it may become necessary to divide it.

(γ.) *Congenital Closure of the Meatus* (*Atresia Urethræ*).—Either the orifice of the urethra only is agglutinated, or closed up by a membrane, or a larger portion of the urethra is impervious. In the first, the urethra, on micturition, is seen to expand up to the point of closure, and the defect may easily be remedied by a slight longitudinal puncture with the exploring trocar; and in the second case, a very rare condition, and almost always complicated with hypo, or epispadia, the operation is very difficult, and ultimately the bladder will have to be punctured if it is not possible to discover the urethra.

(δ.) *Anomalous Openings of the Urethra, Hypospadia and Epispadia.*—In *hypospadia* the urethra is not closed on its under surface to the tip of the penis, but presents an open trough, so that the mouth of the urethra is not found at the point, but on the under surface of the penis. In the milder grades of hypospadia, where the opening is in the course of the penis, the individuals suffer no other inconvenience than that the stream of urine does not flow directly forward but matory disease is usually removed with these lumps, and in a few days it disappears. The cure is accelerated by lotions and compresses dipped in lead-water.

If the prepuce, on account of too severe œdematous swelling, cannot be retracted, the chief cause of this swelling of the smegma cannot, of course, be removed. The result will be an indefinite prolongation of the inflammation, the formation of abscesses, and even perforation of the foreskin. I once treated a boy for a very severe balanitis, whose prepuce could not be retracted by any means. Injections of oil and warm fomentations, which in other cases caused the œdema to disappear, proved ineffectual in this case. On the third day a bluish-black spot appeared in the vicinity of the frænum, indicating circumscribed gangrene. At this time a bright spot became visible through this gangrenous membrane, which, on closer examination, was cut down upon and found to be a knot of a thread, which, upon being pulled out, proved to be quite long. The inflammation and gangrenous disease were arrested by its removal, and the balanitis disappeared. This boy, after retracting the prepuce, had tied a thread around the glans, which soon swelled up, and then he was unable to untie it. The fear of punishment prevented him from confessing his unfortunate act, and he had therefore to wait until the thread made its way out in the manner described. But, as the gangrene did not involve a portion larger than the size of a pea, the effects were of little moment.

The treatment of simple balanitis is limited to the removal of the smegma, subsequent cleanliness, and astringent lotions. There is no danger of union occurring between the prepuce and glans penis.

(3.) Acquired Paraphimosis.—On account of the long, narrow prepuce, a paraphimosis originates in children much more frequently than in adults. Boys find a pleasure in pulling and retracting it so as to expose the whole glans. The narrow aperture of the foreskin, gradually and painlessly dilated by the globular glans, now contracts behind the corona glandis, and it requires more adroitness to return the prepuce in front of the glans than was necessary to pull it back. The alarmed child usually seeks to hide its disaster, the constriction in the mean time causes a marked œdema and deformity of the penis, and the parents, whose attention is finally attracted to it, are extremely frightened by this strange form of the organ. If left to itself, the œdema of the glans will increase for several days, and the penis will become bluish and deformed. Spontaneous, gradual diminution in size will, however, take place in time, for the preputial orifice becomes dilated, and the glans ultimately slips spontaneously behind the foreskin. I have never yet seen gangrene of the glans result from simple constriction of the preputial border. Once, however, from constriction by a thread, as has been related. The slight amount of danger that attends the first form is, in fact, due to the distensibility of the foreskin itself.

Treatment.—A more gratifying treatment than that of paraphimosis can hardly be found. The extremely-alarmed mother brings what she considers a maimed child to the physician, and, after a few minutes, leaves him beaming with joy, for the glans penis, by the successful reduction of the prepuce, has been restored to its normal form.

The entire operation of the reduction simply consists in this: the œdematous prepuce behind the glans is grasped between the two index and middle fingers, while at the same time the glans is pressed backward by both thumbs; a traction of the prepuce forward and a movement of the glans backward are thus produced, and the result of this manipulation is a gliding of the foreskin over the corona glandis, and the latter, in a short time thereafter, regains its normal shape and color. In neglected cases, the glans may first be reduced in size by allowing a stream of cold water to flow over the organ, and the unavoidable pains attending the reduction are also thereby rendered less severe.

I have met with many cases of paraphimosis, but so far have been able to reduce every one of them, and therefore believe that those children's physicians, who advise the use of compresses of lead-water and various astringents until a reduction takes place, are not acquainted with the above procedure.

No after-treatment is necessary, for the part, once reduced to its proper position, soon regains its normal form. There is also no danger of any relapses, for the child who has thus been so terribly frightened has never any more desire to see his glans penis exposed.

(4.) ONANISM (*Masturbatio*).—This practice, though met with in girls, is far more common among boys, and its effects are less significant in the former than in the latter. The term, in boys, is applied to a habit of rubbing or kneading the penis with the naked hand. By this means it is brought into a state of erection, and finally an ejaculation of semen takes place if the boy be of sufficient age. Girls titillate themselves, either with the finger or some similarly-shaped object, in the vagina; but, as pain, redness, and increased secretion of the vaginal mucus, are very apt to result, the habit is often thereby promptly arrested in the girl.

In boys the case is altogether different. They derive such intense delight from this practice that, notwithstanding the severest punishment, and their own best intentions, they are unable to desist from these unfortunate manipulations. They thereby become visibly emaciated and anæmic, and remain backward in their bodily and particularly so in their mental development; the integument of the lower eyelids turns to a brownish or bluish color; they have an apathetic expression of the countenance and flaccid muscles. They become indifferent to amusements which they once enjoyed, and withdraw from all society, preferring to be alone, in order to indulge their passion. The gait becomes unsteady and cumbersome, and the knees fall inward. The emaciation is most strikingly seen on the lower extremities and lumbar region, while the penis increases disproportionately in length and thickness. The prepuce becomes shortened, and is as readily pushed backward as in the adult; the slightest irritation of the penis suffices to induce an erection. The effects of this practice upon health are more or less serious, depending upon circumstances. Tabes dorsalis and paralysis of the lower extremities are occasional though rare effects of this practice.

Children who are the victims of this practice, either from symptoms or instruction, are induced to exert themselves to their utmost to abandon the vice. The success of their effort very much depends upon the age at which they have contracted the habit. The later they have acquired it, and consequently the nearer they are to manhood, the less severe the effects observed from it. Boys over ten years of age, by continual masturbation, finally bring about an ejaculation of a slimy and probably prostatic fluid; but, whether this contains spermatic filaments, has not yet been ascertained, so far as I know. The youngest child, so far as I have information, in whom masturbation has been observed, was a girl eleven months old. According to *Krafft's* description, she alternately pushed both her little hands into the vulva with increasing violence and rapidity; she drew up her lower extremities against the body, grinned, and uttered a loud cry. This report is unique, and it may be questioned whether the child had not an eruption or a foreign body in the vagina, which gave rise to the acts, as those of mere scratching.

The majority of boys who masturbate suffer from the above-mentioned effects, but many retain a blooming appearance, and thrive both bodily and mentally. House physicians of institutions which have large numbers of boys assure me that the majority of confirmed masturbators suffer no bodily detriment from it; and many robust men, with great procreative powers, who consult me for other indispositions, confess that they masturbated for years during their youth.

Causes.—The most common cause is the imitative instinct of the boys. A masturbator shows his curious performance upon his own, or perhaps upon the penis of an inexperienced boy, and from that hour the latter becomes addicted to this vice. Onanism, therefore, occurs much more frequently in boys who have been brought up in an institution than in those that remain in their own families.

Every thing that causes erections promotes onanism. Among these causes may be enumerated heavy feather-beds, too nutritious meat-diet, alcoholic drinks, obscene pictures and stories. It may also be directly induced by itching eruptions on the penis, accumulation of smegma præputii, and by oxyuris vermicularis, which may crawl out of the rectum, and into the vagina, or under the foreskin.

Treatment.—According to the statements of an experienced physician to an institute, nothing can be done with medicines for onanism. All that can be done is to render the practice of the evil as difficult as possible by exercising a strict surveillance. For this purpose guards should be kept constantly in the sleeping-rooms to watch and to punish upon detection. The mattresses should be hard; the coverings ought not to be feather-beds, but blankets of wool or cotton, through which the contours of the body are more easily perceived. The children should be punished very severely, yet the cause must be kept secret from the rest. It is of the greatest importance that as few boys as possible know of this vice, and, for that reason, the speedy dismissal of the masturbator is the best remedy against its spreading. The utmost care should be taken to eradicate the causes mentioned above. It is not politic to examine often and minutely the penis of boys who are suspected, but not proven guilty, for the attention of the innocent might thus be attracted to it, and they thereby become addicted to it. Cold affusions and baths are very valuable remedies for the effects of onanism, such as emaciation and imperfect development. Under no circumstances should iodine, or mineral waters containing iodine, be employed for the obesity which sometimes appears in these children, and on account of which they acquire an extremely comical appearance. Iodine given under these circumstances is liable to induce emaciation and tuberculosis.

The threatenings which are resorted to by some teachers and guardians are, on the whole, very improper; the health is infallibly undermined by them, and death soon follows. They certainly often induce the boys to stop their pernicious practices; but they relapse into a state of deep melancholy, which follows them up to manhood. Proper bodily chastisement serves just as good a purpose, and this sad mental condition is totally avoided.

II.—Testes.

(1.) CRYPTORCHIDIA (from κρυπτός, *concealed*, and ὄρχις, *testicle*).—In the ninth month of fœtal life, the testicles pass out of the abdomen and descend into the scrotum, and a boy at full term comes into the world with both glands in the scrotum. Seven-months children are generally delivered with empty scrotums, the testes not having yet descended. One or the other testis—seldom both—is sometimes absent from the scrotum even in children at full term. They remain some time in the abdomen, or in the canal before descending. About ten per cent. of all boys present some of the forms of this irregularity. In the great majority of these cases the testicle descends without producing any symptoms during the first few weeks of life, so that older children are but very rarely met with who have but one testis in the scrotum, and still more rarely with none. These persons are called monorchides, testicondi, cryptorchides. The last is the most appropriate denomination, for they certainly possess not one but two testicles, which, however, cannot be found in their proper places. If an opportunity occurs to make an autopsy upon a cryptorchis, the retained testis will not be found in its original anatomical place, in the lumbar region, in front and below the kidney, but usually at the entrance of the canalis vaginalis, or within it, or in front of it in the lumbar region, where it may also be detected during life, as a hard elliptical tumor, painful when strongly pressed.

Nature occasionally completes the descent at puberty—descensus testiculi scrotinus—a process unattended by any symptoms, and totally unobserved. The testicle, however, never descends quite to the bottom of the scrotum, for the spermatic cord has been shortened and prevents it. In other cases a violent bearing-down pain is said to occur, and it is even affirmed that persons have died from it. The mechanical cause of death, so far as I am aware, has not been very clearly elucidated. It is, perhaps, caused by gangrene of the constricted testis.

According to *Von Ammon*, the testicle may also make a false passage for itself, and appear in the groin, where it may be mistaken for a crural hernia, or it goes to the perinæum. No other unhappy results of cryptorchia occur; impotence, in particular, is not caused by it.

This malformation cannot be remedied by any aid of art. There is no remedy that will extricate the testicle that has remained in the abdominal cavity, and nothing but injury will be done by any attempt at accelerating its descent from the canal by the aid of expulsive trusses. Compressive means are not advisable, even when a knuckle of intestine escapes from the canal at the same time with the testicle. The best thing to do in this case is, to wait till the testis has entered the scrotum, then to reposit the hernia, and retain it by a good truss.

(2.) HYDROCELE.—A serous double sac, the tunica vaginalis propria, envelops the testis and epididymis, and in the physiological state contains but a few drops of serum, sufficient to lubricate the serous surfaces. In hydrocele, an augmentation of this serum distends the sac; its outward surface is nowhere in contact with the inner, and the scrotum has undergone a visible enlargement. We designate this condition by the name of hydrocele.

In young children, hydrocele occurs extremely often; usually only one side is affected. In most instances it is indebted for its origin to an imperfect closure of the canalis vaginalis, after the testicle has descended to the scrotum. This permits the secretion of the whole peritonæum to descend into the scrotal pouch of this membrane, which becomes distended and produces a hydrocele. It is not congenital in the strictest sense of the term, for it originates a few weeks or months after birth. But the predisposition to it, the open vaginal canal, is congenital, and the same may therefore be said of the hydrocele itself. The following four kinds are distinguished:

(1.) Hydrocele canalis vaginalis testiculi aperta (Pl. III., Fig. 11). This form of hydrocele is rarely seen well defined. It appears as an oblong tumor, extending from the base of the canal downward to beneath the testicle, which testicle cannot be felt at all, or but indistinctly; the spermatic cord, on account of serous infiltration, is distended to the thickness of a common lead-pencil. The characteristic feature about this form is, that the tumor becomes markedly more tense and larger at the moment the abdominal viscera are crowded downward by the act of inspiration, and smaller and softer again with the expiration. The same happens when the scrotum is raised up, by which its contents flow back into the peritoneal cavity. Sometimes this can only be accomplished by the aid of pressure, especially when the canal is narrow. This condition is sometimes liable to be mistaken for an external inguinal hernia. The form is the same, and the contents likewise reducible. Dropsy of the scrotum, however, is markedly translucent, flat on percussion, while a hernia always affords a hollow sound, and the testes cannot be isolated in hydrocele as in a hernia. Indeed, the manner in which the tumor disappears suffices for the experienced diagnostician to distinguish the two conditions with certainty. In hernia, the gut retreats suddenly with a gurgling noise, while in hydrocele the tumor decreases slowly and steadily, not by fits and starts.

(2.) Hydrocele fundi canalis vaginalis testicula clausa (Pl. III., Fig. 12). This is by far the most frequent form. Generally it is not congenital, but makes its appearance a few weeks after birth. The tumor is round, transparent, and cannot be diminished by pressure. The testicle is situated above and behind, and can be felt but imperfectly. The spermatic cord is perfectly normal. This hydrocele is often bilateral, and then, owing to the uniform enlargement of both scrotal sacs, is not so readily observed by the relatives as when one side only is affected.

(3.) Hydrocele colli canalis vaginalis aperta (Pl. III., Fig. 13). Here the spermatic cord is found filled with water, and dilated from its commencement in the abdominal cavity, down half-way, more or less, into the scrotal sac, while, in the depth of the scrotum, a perfectly-normal testis is distinctly felt. The tunica vaginalis surrounds the testicle completely, and is dropsically distended in that portion above the testicle only. Pressure does not reduce the size of the tumor; the serum may be forced back into the peritoneal cavity, but the spermatic cord, on account of the hypertrophy of the tunica vaginalis, never becomes as thin as the one on the sound side. Herniæ may readily become superadded to this, and to the form described in sub. 1, as the vaginal canal remains open. It is sometimes not an easy matter to distinguish this condition from hernia. The disappearance of the tumor, whether slowly or suddenly with a gurgling sound, is the cardinal point in the diagnosis of hernia intestinalis. As this form is very rare, however, we are not often likely to meet with the difficulty attending its diagnosis.

(4.) Hydrocele colli canalis vaginalis clausa (Pl. III., Fig. 14). Here the spermatic cord, at its point of exit from the inguinal ring, is of a normal thickness, and continues in this manner for a short distance, then suddenly becomes distended to an oblong cyst, which terminates as abruptly below; the testis, as in the preceding form, is of a normal size and consistence. These conditions are best recognized by first ascertaining the locality of both testes, comparing them with each other, and then by pulling lightly the testis on the diseased side; by this the examination of the spermatic cord is much facilitated. This form occurs tolerably often; it is usually, however, monolateral. It may, indeed, be displaced, as a sound spermatic cord occasionally is, and cannot be felt. As a rule, however, pressure does not diminish the tumor of this condition, for the vaginal canal is closed.

These comprise the various forms of hydrocele in children. The second and the fourth forms are the most common, while the first and the third are rarely observed.

The contents of these hydroceles, if they have not yet been subjected to any active treatment, are thin, pellucid, light-yellow serum, having the chemical composition of the serum of the blood diluted with water. If it has often already been punctured, or a seton been drawn through it, or irritating ointments rubbed in upon it, the fluid that then escapes on puncturing it is of a milky turbidness, and exhibits a large number of cells.

The spontaneous course of all the forms is, although tardy, almost invariably favorable. A hernia prolapsed through the unclosed inguinal canal is an unfavorable complication, as it is thereby prevented from closing, and the absorption of the hydrocele is retarded. In almost all the other cases spontaneous absorption of the effused fluid takes place in the course of time, although often not till after many months. A thickening of the tunica vaginalis propria only remains behind. Absorption occurs even in the rare cases of hydrocele which communicate with the peritoneal cavity; the inguinal ring generally becomes closed when the lower extremities are more freely exercised.

Treatment.—Since almost all hydroceles, in children who have not yet passed beyond the first year of life, get well spontaneously, it is only a question of promoting this cure by Nature, with appropriate means; those most generally regarded as such are dry warmth, aromatic fumigations, astringent fomentations of ammonia and vinegar, wine, diluted tincture of iodine, etc., and finally compressing the tumor by adhesive plaster or collodium. The congenital open hydroceles heal quickest, when their contents are forced back into the peritoneal cavity and retained there by a truss. The simplest and surest remedy, after all, is acupuncture. This may be performed with any plain sewing-needle. The scrotum is made tense over the tumor with two fingers, and then it is punctured several times in succession. A drop of the serous fluid follows each punctuer, but, while the external openings in the skin instantly close again, the perforations in the tunica albuginea remain open much longer, and the serum now escapes into the other textures, producing an œdema of the scrotum which, after a few days, is spontaneously absorbed; the external and internal lamellæ of the tunica vaginalis have in the mean time become so firmly consolidated that no future effusion can occur. This little operation may subsequently be repeated without any harm, if the first trial be not entirely successful.

Hydrocele in older children, and that of the spermatic cord, disappear also without any surgical interference, by the simple use of iodine locally.

D.—*FEMALE GENITALS.*

(1.). Malformations.—Malformations of the female sexual organs, in general, are rarer than those of the male, and with few exceptions are only discovered at the time of puberty, for the symptoms which they occasion first appear with pubescence.

In order to thoroughly comprehend these malformations, it is necessary to learn from embryology that the uterus, Fallopian tubes, and vagina, are developed in such a manner, from the canals of Müller, that the lower part of the latter is converted into the canalis genitalis, and that a transverse indentation then follows, by which it is divided into two portions, the uterus and the vagina. For this reason all these malformations may be arranged, according to *Veit*, in two classes: the first originates through a defective development of one or both canals of Müller; the second through an abnormal union of the two canals in all other respects perfectly developed.

First class: (a.) The canals of Müller have been entirely arrested in their development, and therefore neither uterus nor vagina exists. The external genitals terminate in a short *cul-de-sac.* (b.) The vagina is present, of a normal length, but the uterus is absent, or it is only rudimentarily developed. (c.) Vagina and neck are of normal size, but the body of the uterus, owing to the defective coalescence of the commencing portions of the canals of Müller, is divided—uterus bicornis—atrophic, and terminates in two atrophic oviducts. (d.) Only one of the canals of Müller is deformed, or totally absent, by which the uterus unicornis originates. The corresponding ovary in this case is mostly normally formed; on the whole, however, the ovaries in deformity of the uterus are generally also defective.

None of these malformations give rise to any symptoms in children, and, as they produce no external alterations of form, remain also undiscovered. But, with the appearance of the menses, various disturbances come on, and a menstruatio vicaria becomes established in some other part of the body.

Second class: (a.) The uterus is well developed, but its cornua are divided—uterus bicornis. (b.) The division runs through the whole organ, two vaginal portions project into the single or also double vagina, in which case even two hymens may exist. (c.) Externally no alteration of form whatever, or only a superficial groove, can be detected on the uterus, but its cavity is divided by a central septum into two perpendicular, adjacent compartments, uterus bilocularis.

Even these malformations have no unpleasant influence upon the development of the child, and are almost always only accidentally seen in autopsies. A divided vagina and double hymen, however, will not escape detection.

The conditions described as malformations of the external genitals usually are not really congenital, but form in the course of years from originally normal genitals. This is especially true of the enlarged clitoris, and the elongated labia majora, the so-called "Hottentot's apron." A partial closure of the external labia occurs besides, in small girls, who have suffered from severe deep diphtheritic ulcerations of those parts, and were not treated with a proper amount of cleanliness and care.

(2.) CATARRH OF THE GENITAL MUCOUS MEMBRANE (*Fluor Albus, Leucorrhœa*).—**Symptoms.**—By fluor albus we understand such an augmented secretion, by the vagina and vulva, that the discharge makes its appearance in drops upon the labia majora, and may flow down upon the perinæum and thighs so as to soil the linen, and, drying, forms large crusts upon the labia. A secondary redness and swelling are thereby produced, and in summer, if the parts are not kept clean, will result in ulceration of the external genitals and adjacent parts.

At first the secretion is thick, bright yellow, homogeneous, but subsequently, toward the end of the disease, or in scrofulous girls, from the very beginning is viscid, muculent, filamentous, poor in cells, very much like the catarrhal mucus of the nose. If ulcerations have already formed, the blood derived from that source becomes mixed with the mucus and gives it a brownish color. It is not possible in little girls to decide the place of origin of this secretion, whether it comes from the uterus or vagina, for the hymen is always swollen and a dilatation of the vagina by the aid of small specula is very properly reluctantly resorted to. The rapid course of leucorrhœa in children shows plainly that the discharge comes from the mucous membrane of the vagina and not from that of the uterus, whereas blennorrhœas of the uterus in the adult are well known to last for years, notwithstanding the most persevering treatment.

If the crusts which agglutinate the external genitals are soaked off, and the vulva, external labia, and hymen are examined, they will be found œdematous, reddened, and painful to the touch. Urethritis, which manifests itself by the flow of pus from the urethra, and by severe pain on micturition, is sometimes, but not frequently, present. Older girls complain also of pain about the genitals, and walk, especially when excoriations are present, with outspread legs, in order to avoid friction as much as possible.

The course of leucorrhœa is always chronic, and I cannot recall a single instance that got well under six weeks; still, there is always a better prospect of recovery than in adults. But, in children with advanced tuberculosis and hectic fever, I have seen it persist till death, in an undiminished degree, and, at the autopsy, that warty granular condition of the vagina, which we so frequently observe in old leucorrhœas of the adult, was found.

Causes.—It certainly cannot be denied that infection through gonorrhœal virus occurs even in children a few years old. An unfortunate superstition exists among the public, that gonorrhœa of the male organ disappears when it is brought in contact with a hymen, and upon this belief many unchaste seductions are committed. Whoever has frequently examined and watched these unfortunate children will have noticed the singular, embarrassed, shy feeling they are affected with. If the simple question be put to them, where did the disease come from, ingenuousness vanishes, and they either protest their innocence with remarkable perfidious vivacity, or are thrown into a state of visible embarrassment, and timidly answer, in an undertone, that they know nothing about it. If nothing strange can be perceived in the conduct of the child, it may be assumed with tolerable certainty that no infection has taken place, and a spontaneous or mechanical origin must be regarded as probable. If condylomata are present upon the labia majora and around the anus, there is no longer any doubt that a true infection has taken place.

Leucorrhœa originates spontaneously, particularly in scrofulous and tuberculous children, living in damp houses. It is also produced mechanically by the introduction of foreign bodies, or from oxyuris gaining admission into the vagina, or lastly by onanism. The funnel-shaped condition and marked tumidity of the external genitals, so urgently insisted upon in medical jurisprudence as a symptom of rape having been committed, can only be of value after frequent repetitions of the act which make the condition well marked. No permanent alteration of form, not even any decided contusion or tumefaction, can ever originate from the simple contact of the glans penis with the hymen.

Treatment.—It is immaterial in the treatment whether the leucorrhœa has originated spontaneously or from gonorrhœal infection. In both cases cleanliness and daily baths render very important service. Those produced mechanically get well quickest—after a piece of wood, a bean, glass bead, or some similar substance, has been removed. These objects, however, are often concealed behind the hymen and are not easily found. The redness and swelling will disappear in a few days.

When leucorrhœa is caused by oxyuris, the cure is about as easily effected by properly syringing the rectum daily with cold water, and the vagina, on account of its greater sensitiveness, with warm water. The prognosis is much worse when onanism is the cause of this disease. On account of the pain it causes, the girls do indeed stop masturbating for a time, but they begin their pernicious practice again as soon as the irritation and pain have subsided, and thus constant relapses are produced, which can only be prevented by the strictest surveillance, which has to be continued unceasingly day and night.

Leucorrhœa that has originated from contact with gonorrhœal contagion lasts at least six weeks, and may persist for many months. The inflammatory affections, redness, pain, and swelling, are at first so severe, that the child is not able to walk, and the discharge rapidly excoriates the labia and thighs. The disease is also most obstinate, even when not gonorrhœal, in very scrofulous or far advanced tuberculous children, in whom it lasts for years, and, when hectic fever comes on, will continue till death.

To robust, healthy children, in whom the disease was produced by infection, laxatives, jalap, senna, aloes, and neutral salts, may be given for a long time with advantage; cachectic individuals, on the contrary, must be treated from the very commencement with tonics, iron, cinchona, and meat diet.

The local treatment, on account of the smallness of space of the infantile genitals, is limited to zealous injections of cold or warm water, and the introduction of a piece of lint into the vulva at bedtime. Much benefit is derived from soaking this compress in a solution of alum (ʒ j to water ℥ j) or of tannin (℈j to water ℥ j). Sulphate of iron and nitrate of silver are indeed also efficacious remedies in leucorrhœa; they, however, totally spoil the linen, and are therefore very reluctantly resorted to by economic mothers.

In scrofulous children, sea-baths and the waters of springs containing iodine (Heilbronn, Kreuznach), likewise cod-liver oil, render the best service. Cutaneous diseases, eczema, impetigo, and prurigo, existing upon the external genitals, must be removed as quickly as possible by cleanliness and desiccating ointments, for they are constantly bathed by the vaginal discharge, and the two evils act injuriously upon each other.

(3.) Diphtheritis and Gangrene of the Female Genitals.—*Diphtheria* rarely if ever occurs sporadically, but only in badly-ventilated hospitals, foundling-houses, and orphan asylums. In this country it is in general rare, and is most frequently encountered during and after malignant epidemics of measles, when it also comes on in the overfilled, damp tenement-houses. Diphtheritis is no local, but a general disease, as has been already elucidated in the chapter on croup, and as is seen from the fever, rapid collapse, and generally fatal termination.

The disease begins like simple fluor albus, with redness and swelling of the vulva, but violent fever, hot skin, frequent pulse, and increasing thirst, soon supervene. If the labia majora are now separated, the mucous membrane will be seen covered with islands of white membrane. In shape they are sometimes circular, sometimes again very irregular, from the coalescence of several islands. At first it is not easy to remove them; they, however, soon disintegrate into shreds, and leave behind them yellowish-gray bases, upon which, after the first shreds have fallen off, new membranous exudations quickly appear. The parts of the mucous membrane free from these exudations are tumid, and of a dirty-red color. The odor of the sanious discharge is very offensive and persistent. The general state of the system indicates a grave disease, the fever assumes a typhous character, the ichor finally emits a gangrenous odor, the false membranes and the subjacent tissues also become gangrenous, and death ensues in a few days from the commencement of the disease.

Gangrene of the vulva is caused either by diphtheria, or comes on like noma, in children who have just passed through a severe febrile disease, such as typhus fever, small-pox, scarlatina, or measles. Sometimes it comes on so rapidly, and without any subjective symptoms, that the attention of the relatives is first attracted by the gangrenous odor. This leads to a careful examination, when a few gangrenous vesicles, as a rule, are found upon the internal surfaces of the labia majora, which soon burst and give exit to a gangrenous ichor. In other instances, where the mortification has invaded the deeper structures of the labia, the latter will become œdematous, assume a bluish color after the pains have existed for several days, and finally burst, when a large gangrenous surface will make its appearance. The mortification is mostly moist, spreads rapidly, and ultimately terminates in death. Besides the local destructions, catarrh of the mucous membrane of the air-passages, and frequently also pyæmic emboli in the lungs, spleen, etc., are found in the cadaver.

Therapeutics.—The treatment of these serious diseases is very unsatisfactory. Internally, carbonate of potassa (ʒj daily) is recommended as a specific in the diphtheritis; usually, however, the fatal end cannot be averted even by this remedy. The stimulating treatment should be resorted to as early as possible, especially in gangrene. Topically, the parts should be pencilled with concentrated mineral acids, or a strong solution of corrosive sublimate. The latter exercises a marked favorable effect upon the diphtheria, while in gangrene it has invariably proved inert in all those cases that I have observed.

(4.) HÆMORRHAGIA VAGINÆ (Bleeding from the Vagina).—In a new-born girl, or in girls a few days old, a slight vaginal hæmorrhage is observed in some rare cases. Usually, the bleeding is insignificant, and a few drops only ooze out from between the labia during the day. The breasts often swell up at the same time, and on moderate pressure will give exit to a few drops of milky fluid.

Vaginal hæmorrhage never becomes profuse, and as such is not dangerous; but, in the two cases that I have had the opportunity to observe, profuse intestinal catarrh and atrophy ensued in a few days, a condition which, after all, may perhaps more justly be attributed to the want of the breast of the mother, than to the preceding hæmorrhage.

Billard and *Ollivier d'Angers* have often met with these small hæmorrhages, but were unable to perceive any bad effects from them.

Therapeutics.—On account of the insignificancy of the bleeding, it does not seem advisable to resort to cold-water injections or the introduction of styptics for its premature arrest. It is best to wait till it stops spontaneously; the warm water-baths, however, should be omitted so long as it continues.

(5.) INFLAMMATION OF THE BREASTS (*Mastitis Neonatorum*).—We conclude the affections of the female genitals with mastitis neonatorum, although it does not exactly belong here, for it occurs as often in new-born boys as in girls. To comprehend this peculiar process, observable only in the first few weeks of life, it is necessary to premise that the breasts of most new-born children, when slightly pressed, will discharge a small quantity of thin milk, which, after eight to fourteen days in the male child, disappears forever, but in the female till the first pregnancy.

According to *Guillot's* investigations, it is neutral or alkaline, but becomes acid if allowed to stand, and then separates into two parts. Microscopically, colostrum corpuscles are found in it in great abundance. It does not by any means taste sweet, but somewhat insipid, or even salty, of which I have frequently convinced myself.

This temporary secretion of milk makes the breasts of the new-born child as disposed to inflammation as those of suckling women. Pressure or a bruise, which, during the delivery, may be unavoidable, suffices to induce inflammation and suppuration of the breasts. Meddlesome midwives are often to blame for this affection, for they make the inexperienced mothers believe that the milk has to be assiduously squeezed out. Redness and swelling of the gland result from this operation; and at length, on touching the breasts, the child sets up a cry of pain, the swelling increases, and fluctuation is finally felt at some place; and, when the abscess bursts, a large quantity of thick pus escapes. Suppuration lasts for a few days, after which the abscess closes, the gland remains for some time indurated, but, after a few weeks, complete *restitutio in integrum* has taken place. In cachectic children who suffer at the same time from thrush and diarrhœa, the erysipelatous redness will extend over a large portion of the thorax, and, after spontaneous or artificial opening of the abscesses, large patches of cellular tissue will slough off, and fistulous ulcerations will remain for a long time. The only bad effect of suppurative mastitis in girls is, that the nipple and even the whole gland may shrink up, when the mamma, thus altered, will be partially or totally unable to perform its function at the time when the duty of lactation begins.

Therapeutics.—A rational prophylaxis is the main indication. If the glands are swollen, but not yet reddened and painful, the transition into suppuration, in most cases, may be prevented, if all pressure and irritation are carefully avoided, and the occlusion of the lacteal ducts obviated by inunctions of olive-oil. To accomplish the first indication, a fine piece of oiled linen is laid upon the breast, and over this some lamb's-wool. In this manner we may almost always succeed in reducing the œdema, and in bringing about a normal condition of the gland. But, if it nevertheless suppurates, the oiled linen is none the less useful, but the lamb's-wool should be changed for bags of dry, warm bran, because the ripening of the abscess is accelerated by them. In puncturing the abscess, the nipple should be avoided, for the cicatricial contraction resulting from the wound will invariably pull it down and deform it, and this, in the after-life of the girl, may exercise a very unfavorable influence upon the nursing of her children. The incision should be in the direction of radial lines from the nipple as a centre. After the pus has escaped, plain, moist, warm compresses are applied, by which crusts are prevented from forming, and the lips of the wound from prematurely closing. In otherwise healthy children the wound will close in a few days; in atrophic children, where collapse is vastly accelerated by the suppuration, the pus becomes flocculent, and thin, and the wound remains open until death.

CHAPTER VII.

DISEASES OF THE SKIN.

All the diseases of the skin occur in *children*, and most of them indeed *much more frequently* than in adults. As, however, in the plan of this work, a knowledge of special pathology, and also of the cutaneous affections, is presumed to have been already acquired, we limit ourselves to the consideration of those morbid alterations of the skin which are almost exclusively observed in children; or, if they also occur frequently in adults, require in children, on account of the greater delicacy of the skin, a different treatment. Some of the diseases of the skin have already been described in former chapters, for example: seborrhœa capillitii, page 6; sclerema, page 67; cancer aquaticus, page 97; the eruptions during the first dentition, page 107; in abdominal typhus, page 187; nævus vasculosus, page 242. Other markedly cachectic eruptions will be treated of with the cachexiæ, syphilis, and scrofula, and thus we have only remaining for this section the acute exanthemata, and a few chronic efflorescences.

(1.) Scarlet Fever (*Scarlatina*).—Scarlet fever, as, in fact, all acute contagious exanthemata, is not to be regarded as a simple cutaneous affection, but more as a general disease, of which the morbid alteration of the skin may certainly be looked upon as the most striking symptom. It has always been the subject of attention from authors, to such an extent, indeed, that *Canstatt* collected a list of one hundred and ninety-one works upon this subject, which had been published before 1846. Since that date several dozens of works upon it have been added to the list. This large number of treatises is due to the ease with which it is observed, its frequent occurrence, and to the peculiar fact that almost every epidemic furnishes some slight modification, which in former epidemics was but little and imperfectly observed. To simplify the study of this affection, we will first present a description of a regular scarlet fever, and all the variations and complications will follow in a special section.

A.—*NORMAL SCARLET FEVER (SCARLATINA LEGITIMA).*

Symptoms.—Legitimate scarlet fever runs through three tolerably sharply-defined stages: (1), incubation and premonition; (2), eruption and efflorescence of the exanthema; and (3), its disappearance, with final desquamation.

1.) The Stadium of Incubation and Premonition.—The incubation lasts from the day of infection till the appearance of the febrile chill; thence the precursory stage is reckoned. This period is by no means alike in all children; in most instances it lasts from six to eight days. Accounts of very great deviations from this are to be accepted with the utmost caution, for it is very seldom possible during an epidemic to determine the day of infection with absolute certainty. The opportunities for infection, by means of personal intercourse, especially with still-desquamating convalescents, or by transmission through a third person, are so variable and difficult to be controlled, that one may well doubt the statements which vary considerably from the general average, six to eight days.

So long as it is not known that the children are infected, no symptoms are usually observed during the period of incubation. But, when the parents have once ascertained that their child has been exposed to the contagion, from that hour they observe a host of symptoms, most of which are of a subjective nature, and furnish a more positive proof of parental anxiety than of medical acuteness. Some few cases, however, do in fact occur where the children feel unwell from the moment of infection, are depressed, sleep restlessly, and have less appetite, till finally distinct febrile symptoms indicate the commencement of the precursory stage.

The real premonitory stage embraces a period of from one to three days. The symptoms which appear during it are always so marked that the relatives notice them, yet are by no means on that account always the same. They do not, as a rule, possess much that is characteristic. Slight chilliness, hot and cold flashes, or a shivering chill, heightened temperature of the skin, very rapid pulse, severe thirst, anorexia, nausea, and, when the fever appears, sudden vomiting, are the ordinary phenomena. There is one symptom, especially during the prevalence of an epidemic, which makes the eruption of a scarlet fever more than probable, and that is a slight angina, occasioned by general redness and swelling of the whole posterior part of the mouth, palate, and fauces. The additional cardinal points for the diagnosis of a scarlet fever are remarkably hot breath, great frequency of the pulse, a burning-hot skin, and severe vespertine exacerbations, which may become aggravated into convulsions and delirium.

After these symptoms have lasted one, or, at the longest, three days, the eruption begins to break out, and with it the second stage.

2.) THE STAGE OF ERUPTION AND FLORESCENCE. — The exanthema first appears upon the neck and face, then spreads rapidly over the whole body, and in twelve hours the eruption is at its height. It begins by the appearance of barely-visible, impalpable, small red points upon the neck, quickly followed by a marked erythema. When the erythema does not uniformly cover the whole body, and occurs only in the form of large, red spots upon white, normal ground, then this kind is described as scarlatina variegata; when the whole body is reddened, as scarlatina levigata. These two forms cannot be entirely separated, for often the one is observed on some parts of the body, while the other is seen upon other parts, and still more frequently the scarlatina variegata at the climax of the disease becomes scarlatina levigata.

Previously-healthy, well-nourished children become, in the true sense of the word, as red as "boiled lobster;" the feebler the patients, the less intense will be the erythema. The erythema is darkest in the vespertine exacerbations, and during bodily exertions or crying, and least intense when the children are uncovered and become cool.

Normal, simple scarlatina lasts fully four days. During the first two days the redness of the skin and general symptoms reach their climax; in the next two the local as well as the general subside.

Simultaneously with the eruption of the exanthema, the anginous difficulties become considerably aggravated; still, the angina of scarlet fever is never as severe and painful as a simple tonsillitis with marked tumefaction and incipient suppuration. The so-called scarlet-fever tongue is also most characteristic after the eruption. Its root and centre are covered white, its borders and apex colored dark red, the papillæ filiformes are slightly swollen, and give it a granular appearance, on account of which, and the similarity of color, the name of "raspberry tongue" has not unaptly been bestowed upon it. Occasionally the papillæ are so intensely swollen that they also project boldly backward like red points, where the white fur has already formed, and thus make the tongue appear villous.

During the first days the temperature of the skin is very high—higher, according to the sense of touch, on those places which are reddest. I once found it in the axilla, on the first day of the eruption, to have risen to 107° F. The pulse is likewise very high, and the thirst great. The profound general depression, which sometimes becomes so serious, before the eruption of the exanthema, that the patient seems perfectly moribund, subsides after the eruption has appeared.

Heim formerly claimed that scarlet-fever patients emitted a peculiar odor. The odor is described as very offensive, and has been compared to brine, old cheese, or even to that of a *menagerie*. Possessing extraordinarily acute olfactory nerves, I have with all carefulness sought this supposed specific odor in many patients, but have never yet been able to detect it. True, very many children smell unpleasantly, but that is due to the circumstances that the parents will, under no consideration, consent to have the linen of the children and bedclothes changed; they even set them upon the chamber-pot in bed, and often will not touch them with a wet sponge for more than a week. From this there results a mixture of odors, to which fæces, urine, and perspiration, contribute the chief component parts. This so-called specific odor disappears in every instance so soon as the anus and genitals have been properly cleaned, the linen changed, and the children placed in a fresh bed.

It is possible that, in *Heim's* time, scarlatina was accompanied by such an odor; in our time it is not the case.

Toward the fourth day, all the local and general symptoms subside considerably. The angina disappears entirely, the exanthema fades, the fever is limited to the vespertine exacerbations which are growing feebler, the children sit up, begin to amuse themselves, and call for food.

3.) THE STAGE OF DESQUAMATION.—The erythema begins to fade on those places where it was first observed, on the neck and breast, and disappears last from the lumbar region and inner surfaces of the thighs, where the last traces may be seen up to the sixth and seventh day from the commencement of the eruption. Previous to the desquamation, a profuse perspiration and tolerably severe itching break out in most cases, after which the epidermis becomes cracked, and is cast off here and there in large scales or laminæ. The new epidermis during the first few days is of a feeble rosy-red color and has a singular smoothness, but soon assumes the qualities of that just cast off. The exfoliation progresses upon the fingers and toes on a grand scale. It is here sometimes peeled off in continuous masses like glove-fingers. A similar process of desquamation also takes place on the mucous membranes. The patients hawk and expectorate, without much difficulty, a turbid phlegm, the tongue likewise casts off its epithelium, the urine becomes opaque and contains enormous quantities of epithelium from the various sections of the uropoëtic system. Lastly, several large, muculent stools, of a putrid, penetrating odor, are also evacuated.

The desquamation usually begins directly after the exanthema has begun to fade, but may, however, be retarded for fourteen days. This happens especially when the recovery is interrupted by some intercurrent process, for example, dentition or a catarrh of the bronchi, or of the alimentary canal, etc. The more intense the erythema, the more rapid and thick will be the desquamation.

This is the picture of *legitimate scarlet fever.* Its variations are numerous, and can never be exhaustively described. They may be best regarded from the following points of view: (1.) Incompleteness or variations of form of the exanthema. (2.) Modifications in the participation of the mucous membrane. (3.) Intensity of the general affection; and (4.) Anomalous localizations.

B.—*VARIATIONS OF SCARLET FEVER.*

1.) INCOMPLETENESS OR MODIFICATIONS OF FORM OF THE EXANTHEMA.—Erythema of the skin and angina are the principal symptoms necessary to constitute a perfect scarlet fever. When one of these two is absent, then we have the variation of an incomplete scarlatina, indicated according to the absence of the one or the other: (1), scarlatina sine angina; and (2), scarlatina sine exanthema.

ad 1.) This form is observed tolerably often. The rash may break out perfectly, run a regular course, the desquamation may take place at the right time and properly, and yet the patients do not complain of any difficulty in deglutition and the tonsils are not swollen, scarcely reddened. The general symptoms are here never of especial severity, and the affection of the mucous membrane is always slight.

ad 2.) However easy it may be to diagnosticate the first variety, it is by no means so easy to detect the second, for it is, indeed, possible to mistake it for a simple angina, which children may also acquire during an epidemic of scarlet fever. The characteristic indices in scarlatina angina are: the diffused redness, the raspberry tongue, the rarity of suppuration of the tonsils, and the severity of the fever, all of which symptoms, however, may also occur without scarlatina, in simple angina of a nervous child. Angina of scarlet fever can only, then, be diagnosticated with certainty when the same individual has already, on a former occasion, been treated for a simple angina, and a marked difference in the form of the two fevers is perceived.

Many authors assert that a child may also desquamate completely after scarlatina without exanthema. I have never yet observed this, and regard it more prudent, in real desquamation, to assume the existance of an eruption, although of but a few hours' duration.

Between these two forms there are, naturally, a number of intermediate ones. There are whole epidemics where the exanthema is comparatively severe, the angina slight, and conversely, epidemics where the angina produces very severe symptoms, while the exanthema is visible but for a short time, and only on some parts of the body.

Regarding the form of exanthema, we have, first of all (1), *scarlatina variegata;* (2), *scarlatina levigata.* In the former, red patches, of the size of a silver dollar up to that of a hand, first appear, which may remain separated from each other by a streak of healthy integument. In the latter, the whole skin, from the face to the feet, becomes scarlet, in which case the desquamation is always extremely intense. At the acme of the exanthema the first form will, in fact, run into the second.

When the exudation of the cutis is considerable, a countless number of minute tubercles will arise on the surface of the body, owing to which the integument feels rough, like a goose's skin.

These nodules originate by enlargement of the papillæ of the skin. This kind is called *scarlatina papulosa.*

Lastly, when the exudation is still greater, the effusion will gather into vesicles of the size of poppy-seeds, which are scattered in countless numbers over the whole body. They contain an alkaline turbid fluid, and an extensive desquamation ensues after these have ruptured.

In some epidemics these vesicles stand so closely together that they coalesce, a condition that has been denominated scarlatina vesiculosa, pustulosa, pemphigoida. Miliaries usually form only in very well-pronounced, severe cases.

2.) MODIFICATIONS IN THE PARTICIPATION OF THE MUCOUS MEMBRANE.—That scarlet fever is no cutaneous, but a general disease, is seen principally from the numerous affections of the mucous membrane that accompany it.

On the usual places, in the cavity of the mouth, the morbid lesions vary extremely in intensity. The palate and tonsils are either only simply reddened, or reddened and severely swollen, or in malignant epidemics, under unfavorable external circumstances, may become covered with grayish-white membranes, forming angina diphtheritica. Most frequently the diphtheritic membranes occur upon the tonsils, and may be partially detached by gargling, when the mucous membrane beneath will be seen reddened, eroded, and after a few hours becomes covered again with new pseudo-membranes. The odor from the mouth is very offensive, deglutition is difficult, and a fetid mucus flows from the nose when the diphtheria extends upward into the choanæ. The adjacent submaxillary and cervical glands are then always swollen and occasionally suppurate. The affection of the general system is always uncommonly grave, and collapse ensues rapidly when the diphtheritis becomes gangrenous; along with which the odor from the mouth becomes intolerably putrid, great difficulty in deglutition and respiration, delirium or coma, come on, and these are soon followed by death.

The angina likewise shows variations in regard to its extent. In benign epidemics, it is confined to the palate and tonsils, but, when the diphtheritic form appears, extends also to the Eustachian tubes, nasal passages, Highmorian cavities, pharynx and larynx, by which, according to the affected parts, deafness, coryza, dysphagia, and dyspnœa, supervene. Epidemics with diphtheritic, and, still more, gangrenous angina, always belong to the malignant.

3.) INTENSITY OF THE AFFECTION OF THE GENERAL SYSTEM.—Our predecessors assumed, (1), an erethitic, (2), a synochal, (3), a torpid, and (4), a septic scarlatina. Although this division into different forms cannot always be strictly carried out, for often several of them are observed during the course of the same case, still it must be acknowledged that the character of the general reaction may be very different in different epidemics. To this variation, that seen individually is yet to be added. In general, it may be assumed that the stronger and healthier the child was before it was attacked by the scarlet fever, the more synochal or violent will be the reaction of its organism; and the feebler and more cachectic, the more septic will be the symptoms.

By erethitic scarlatina is understood a morbid condition like that we have presented above as a normal scarlet fever. The eruption and the local and general phenomena appear with no dangerous severity, and the termination is therefore always favorable. Still, such a result cannot always be predicted from the character of the precursory stage and eruption, for the character of the fever may change at any time.

The synochal, inflammatory form is distinguished by the rapid appearance of the disease, violent fever, intensely-developed exanthema, accompanied by miliaries, considerable angina, and cerebral phenomena, sleeplessness, delirium, headache, and intolerance of light.

In some epidemics, the torpid or the nervous form is predominant. In this case the disease begins from the very first with great prostration, vertigo, muttering delirium, syncope, and coma. The pulse is extremely rapid, but small, and readily compressed. The angina is disposed to take on the diphtheritic form. The exanthema breaks out only imperfectly on some parts of the body; the extremities are oftener cool than warm. The tongue becomes dry, as in typhus-fever patients; in fact, even profuse diarrhœa comes on, and the patients usually die very soon after, or between the second and fourth day of the disease. No local causes sufficient to explain the death, as a rule, are found at the autopsy, so that we have to assume the influence of a supposed scarlet-fever poison upon the blood and nervous system. When children survive this stage of the disease, they are still liable to suffer from its sequelæ, and the convalescence in all cases goes on very slowly.

The septic form may be looked upon as the highest grade of the disease in which the eruption usually does not break out at all, and the diphtheria of the mouth soon becomes gangrenous, death ensuing in the shortest time it ever occurs in scarlatina, and preceded by the formation of petechiæ, profuse hæmorrhage from the nasal mucous membrane, from the bowels, and from the kidneys.

4.) Anomalous Localizations.—The local lesions are not always limited to the skin and mouth. In some epidemics other organs become involved. Thus it is reported of some epidemics, where many children, at the climax of the disease, were attacked by pleurisy or pneumonia, and succumbed to them. In others, the children died suddenly under tetanic convulsions and severe œdema; even purulent effusion in the brain was found at the autopsy. Sometimes the intestinal mucous membrane participates in a high degree, especially at the commencement of desquamation, and profuse intestinal catarrh, or dysenteric diarrhœa, with very painful tenesmus, comes on. But the most frequent of all anomalous localizations is that upon the kidneys, by which acute Bright's dropsy is produced. This has already been treated of in detail on page 443. In some epidemics it occurs very early in the disease; in others it is hardly observed at all. In the latter epidemics, in Munich, it was one of the greatest rarities, and did not appear even among the poorest class, where the want of all care and attention would lead us to expect it with great certainty. In other epidemics half, and even more, of all the patients became dropsical, notwithstanding the best of care and nursing; and, although it cannot be denied that a judicious treatment might possibly be capable of warding it off, still it must be confessed that the main cause is to be looked for in the character of the epidemic.

Where the angina is considerable, very generally tumefaction of the cervical lymphatic glands, and occasionally parotitis, supervene. More details concerning this affection are to be found on page 115, in the section which treats of metastatic parotitis. From the same source a coryza or an otorrhœa may also become developed by the disease of the mucous membrane, particularly the diphtheritic form, extending into the nares, or, by implication of the Eustachian tubes, induce an otorrhœa interna, which may result in perforation of the tympanum.

Lastly, *metastases* on the subcutaneous cellular tissue, with profuse suppuration, are also observed, and in the torpid and septic form gangrenous bed-sores quickly come on.

The *sequelæ* of a grave scarlet fever are very numerous. Those most frequently observed are chronic serous effusions into the pleura or peritonæum after Bright's disease, imbecility, chorea, paralysis, deafness, blindness, and noma, in cachectic children improperly cared for.

The differential diagnosis of scarlatina and measles will be given presently, when we speak of measles. Neither pathological anatomy, nor the chemical investigations of the blood, nor of the excretions, furnish any clew regarding the nature of scarlatina-poison. No constant morbid alterations, with the exception of tumefaction or diphtheritis of the tonsils, are usually found in the cadaver.

Etiology.—Scarlatina originates by contagion. It adheres strongest to the scales of the integument which were thrown off during desquamation, and for that reason, also, does infection occur most frequently at this time, and *not* during the florescence of the exanthema, during which it is most possible to transport the disease with the patient, and thus limit its extension. On the whole, the epoch with which the capacity for infection begins and terminates is not yet positively established. Instances are related where children infected others during the precursory stage, and some again where infection took place long after desquamation had been completed.

The contagiousness is not equally declared in all cases; in some it is so eminent that all the children of a family fall sick as soon as the fever has broken out in one; in others it is so mild that the majority of the family remain well, notwithstanding frequent intercourse. *Stoll*, *Harwood*, and *Miquel*, have performed numerous inoculations with scarlatinal blood, or serum, from the miliary vesicles, and frequently succeeded in producing scarlet fever, which was as severe as, and even more so than, the one employed for the inoculation. If only an infection, and no weakening or diminished localization of the poison can be attained by the inoculation, then, of course, it fails in its object. For that purpose it is not necessary at all to resort to this complicated manipulation; simple contact with the scarlet-fever patients is all that is requisite. Children between two and twelve years of age are most susceptible to the contagion. Very small children are but rarely subject to the fever, and only become affected by it in severe epidemics. The mortality varies from two to twenty per cent. Some very reliable authors assert that a person may have scarlet-fever twice. This, however, seems to occur so very infrequently that there is a greater reason to assume an error in the observation—which, on account of the diagnostic difficulties of some cases, is very excusable—than to believe in the actual occurrence of such instances.

Treatment.—In consequence of the variation of the individual epidemics, it is impossible to prescribe one system of treatment that would be applicable to all scarlatinas; moreover, this variation destroys all faith in the many remedies lauded as specifics.

It is useless to name here the numerous prophylactic remedies, since none have actually proved to be such. The only rational prophylaxis consists in an entire isolation of the children from all scarlatinal patients and all persons who come in contact with such patients. This isolation must last at least from five to six weeks for each patient, but how far and in what roundabout ways the fever may be transported by a third person, it is altogether impossible to say. In grave epidemics, in which a majority of the patients perish, it is best for the children to leave the city altogether, but that is frequently attended by great sacrifices, as the epidemics often rage for a long time and simultaneously in many cities.

The treatment of scarlatina is either attempted with specifics and methods, or it is simply expectant and controlled by the symptoms.

To the specific remedies belong: carbonate of ammonia, ʒ j— ʒ ii, in a ℥ v solution—chlorine-water, ʒ j, in an ℥ viii solution; the mineral acids; acetic acid, ʒ ss— ʒ j pro die.

The specific methods were, and in part are still: general abstraction of blood, emetics and aperients, and cold affusions—infrictions of fat, often eulogized and again forgotten, and lately urgently recommended by *Schneemann*, in conjunction with cooling treatment. The methodical cold-water treatment, it is true, has not produced the harm dreaded by the older physicians, but in grave epidemics it has proved to be totally inefficacious. This author causes the entire body of the patients, with the exception of the head, to be rubbed with lard, from the first day on, for three weeks, morning, noon, and evening; in the fourth week once a day only. With this, the temperature of the room should not be above 60° F.; the bed protected from cold during the eruption only, cooling drinks so long as the fever lasts, and internally no remedies are to be given. *Schneemann* very justly lays great stress upon thorough and often-repeated ventilation, but carries his cooling treatment somewhat too far when he advises the temperature of the room to be reduced to between 57° and 59°, and the windows of the sick-room to be kept open three hours every day.

It need hardly be stated that these specific remedies and specific methods have no specific effect whatever, and all of them, in grave epidemics, are set at defiance by the virulence of the scarlatinal poison. In milder epidemics, those remedies are best which torture the children least, and husband their enfeebled strength. Of all the remedies, the preference should therefore be given to a diluted mineral acid; of all the methods, to a moderate infriction of fat.

The expectant treatment of the symptoms is limited to the removal of the patient from all noxious agents, and to the palliation of the particularly grave symptoms.

Proper ventilation of the sick-room is always the best guarantee of a favorable course. This is carried out to the greatest perfection when two adjoining rooms are devoted to the use of the patient, and he spends half the day in one, and half the day in the other room. The temperature of the room should be 60° F., so long as the exanthema lasts; after it has grown pale, or if it did not become properly developed, the temperature should rather be raised than diminished. The garments of the child and bedclothes should be so arranged that it is not kept in a constant state of perspiration, but yet so as not to be chilled. The diet, so long as the fever lasts, should be antiphlogistic; where constipation exists, a mild aperient, of some composition which the child will readily take, should be employed; and, where there is a disposition to diarrhœa, constipating soups and mucilaginous drinks should be given. When the fever is gone, such a scanty diet will vastly retard convalescence; and no apprehension need be entertained in regard to the use of mild, easily-digested, plain articles of food.

When desquamation has been in full progress for several days, its completion may be accelerated by a few baths, given with great caution, after which the patient may be gradually taken out into the free air. In order to guard against all possible reproach, it is well not to allow the patients to go out of the house for six weeks; but this, of course, cannot be accomplished among the lower classes, and where the care of the children is neglected. In normal scarlatina any simple slightly acidulous, saline, or mucilaginous drinks may be given internally as a vehicle for ammon. carb. ʒ ss, daily, in cases where the exanthema is imperfectly developed. In the treatment of symptoms, it is well to observe that, in some of the gravest and most threatening ones, neither hasty nor too energetic measures should be adopted. The violent fever before the eruption may tempt us to resort to the abstraction of blood, or to the use of calomel; but we should always bear in mind that the course of the disease is likely to be retarded by these measures, while the fever is not made to disappear.

Where the eruption is very much retarded, an attempt should be made, by the aid of sinapisms, sponging of the body with warm water, vinegar, or lye, to hasten its progress. Where the rash is already developed, infriction of lard is the most advantageous treatment, by which the annoying itching is palliated, and the protection against any sudden cooling of the skin is effected.

Threatening cerebral symptoms, delirium, stupor, or coma, are materially relieved by very cold affusions of the closely-shorn head, which must be repeated every hour. In the torpid, septic form, the powers of the system should be sustained by quinine, camphor, wine, musk, and castoreum.

In malignant diphtheritic anginas an energetic local treatment, by the application of concentrated muriatic acid or a solution of nitrate of silver, would be very beneficial. But the prostration of the patients and their resistance form great obstacles to this part of the treatment. For the same reason it is but seldom possible to employ gargles, and we have therefore to limit ourselves to the administration of such internal remedies as are regarded as specifics. The best of these are carbonate of soda and chlorate of potassa; the first has a really favorable effect in cleaning the mucous membrane, the second destroys the putrid odor. Both are given separately, dissolved in water, a drachm of each daily.

The treatment of albuminuria has already been spoken of on a former occasion, likewise that of parotitis after scarlatina. Intestinal catarrh must be relieved as rapidly as possible by the aid of opium, and mucilaginous and astringent remedies. Paralysis and convulsions call for the treatment prescribed for these affections on pages 394 and 388. Consecutive inflammations of the joints and serous effusions improve by the aid of warm anodyne cataplasms and resolvents.

(2.) MEASLES (*Morbilli*).—By measles is meant an acute contagious eruption of the skin, which manifests itself by small, round, red spots, attended by catarrhal phenomena, and terminates by a furfuraceous desquamation of the epidermis.

Since the individual epidemics of measles, just like epidemics of scarlet fever, present marked variations, and are very different in their course, their danger, and in their sequelæ, it will be more advantageous to first give a description of a normal case, and then to speak of its modifications.

A.—*NORMAL MORBILLI.*

(1), A stadium of prodromata; (2), a stadium of eruption; (3), a stadium of florescence; and, (4), a stadium of desquamation, may be distinguished with tolerable precision.

1.) THE PRODROMATA STAGE (*Stadium Invasionis*).—In robust children and mild epidemics, the prodromes are not so violent as to cause the children to take to bed, or to present any signs of a serious disease. The most common difficulties are: catarrh of the nose and sneezing, with consecutive swelling of the nasal mucous membrane, reddened conjunctivæ, lachrymation, slight blepharitis, intolerance of light, hoarseness, and a dry, barking cough. The general symptoms are reduced to languor, prostration, anorexia, slightly-increased temperature of the skin, thirst, and vespertine exacerbations, which, in nervous children, may attain to delirium at night. The tongue is coated, taste bad, and pressure upon the stomach painful. Occasionally the febrile symptoms decline somewhat after a profuse epistaxis.

All these symptoms increase in intensity from day to day, and usually manifest themselves only a few days after infection occurred.

According to *Kerschensteiner's* accurate observations, a period of from ten to twelve days always intervenes between the day that the first child in a family is attacked by measles and the day the other children to whom he gives the disease fall sick. *Panum*, who under extremely favorable circumstances watched an epidemic of measles on the Faroe Islands, assumes a stadium of precisely fourteen days. But, since we know that the exanthema also infects as soon as it has appeared upon the skin, it may therefore be assumed with great probability that the children who subsequently fell sick carried about them the morbilli poison for from ten to fourteen days. The prodromes do not come on till from three to five days before the actual breaking out of the exanthema, and hence it is clear that the morbilli poison remains perfectly inert for the first six or seven days after its reception.

2.) STADIUM ERUPTIONIS.—The exanthema first appears on the face, cheeks, or dorsum of the nose, and from these places creeps over the neck to the trunk, on the upper, and lastly on the lower extremities. In previously healthy children, the eruption is completed in twelve hours; in general, however, it progresses slower than that of scarlet fever.

The exanthema begins with faint red, small round spots, of the size of a lentil. These constantly grow redder—coalesce, when they stand close together, into irregular figures; still there is always some intervening normal integument. As they increase in redness, they also grow in height, and become elevated over the level of the skin, and, when they have attained to their utmost height, turn somewhat yellowish, but never form vesicles. Similarly red, elevated spots of the skin are present in genuine variola, which last for several hours, and cannot be distinguished from those of measles. But the general symptoms in these two exanthemata differ vastly, and genuine variola is hardly ever met with nowadays in civilized countries, on account of compulsory vaccination.

The red, elevated spots feel rougher than the normal integument, and the hand in passing over them perceives a very peculiar feel of unequal hardness. The mucous membrane of the mouth, in fact, also displays some unequally red spots, but here the exanthema is by far less distinct than in scarlatina.

The general symptoms reach their climax with the breaking out of the fever; most of the patients are delirious, very restless, and mislead one to suspect a very grave disease. The bowels are constipated; the urine is dark red, rich in uric acid and urates.

3.) STADIUM FLORESCENTIÆ.—Measles are visible on the skin for four days; the fever and mucous-membrane symptoms continue in a moderate degree, but the general disturbances visibly decline. The eruption fades in the same order of procession as it appeared, namely, first in the face, next on the trunk, and lastly on the extremities. The greatest amount of tension and swelling is seen on the second day after the eruption; by the fourth these have subsided. The integument sometimes becomes yellowish before it returns to its normal color, and by the fourth day only indistinct traces of the faded exanthema are seen. The conjunctivitis and nasal catarrh also improve, while the bronchitis, on account of the great extent of the ramifications of the respiratory mucous membrane, often continues for a long time, and even in a severer degree than at the beginning. Here the expectoration is very considerable. As soon as the exanthema has faded on the whole body, the skin begins to desquamate, and the process is known as the

4.) STAGE OF DESQUAMATION (*Stadium Desquamationis*).—Wherever the eruption occurred, there the epidermis is thrown off; not, however, as in scarlatina, in large laminæ, but always only in very small scales, which often lie upon the skin like a white dust, and is best seen when it is rubbed with a black cloth. The more abundant the exanthema, the more whitened and dusty will the cloth become. The mucous membrane of the nose and eyes is now perfectly free, but that of the bronchi, even in normal measles, discharges a considerable quantity of secretion for several weeks by coughing.

The general condition improves remarkably quickly, so that it is scarcely possible to keep the child in bed for more than three or four days after the exanthema has faded. With the exception of the cough, that annoys them but little, these patients are now entirely free from all morbid derangements; they sleep well, their appetite is excellent, the stools and urine are normal, and the strength, which had been considerably reduced by the disease, is recovered in a few days. This is the picture of a normal case of measles, as seen, in any moderate epidemic, in an otherwise healthy child.

B.—*VARIATIONS AND SEQUELÆ.*

These are (1), deviations in reference to the exanthema; (2), in reference to the mucous membranes; (3), in reference to the general affection; and (4), a list of frequent and malignant sequelæ.

1.) Modification of the Exanthema.—The exanthema does not always appear in the order above described. In the nervous, irritable child, especially when covered with superfluous clothing, it breaks out as early as the second day after the appearance of the prodromata, and often departs from its usual order of progress. It may appear first on the extremities instead of the face: the small, red dots may coalesce in some places, and then it becomes difficult to distinguish this eruption from that of scarlatina. These larger spots, however, are never diffused over the whole body, and, besides, they always possess points sufficiently characteristic of measles not to be confounded. An eruption of vesicles, the so-called miliaries, also sometimes appears in the course of measles—still much more infrequently than in scarlatina. When it does occur, however, the desquamation is always more abundant, and larger laminæ are cast off. In malignant epidemics, the exanthemata become bluish, and do not entirely disappear, but leave behind them ecchymosis, and are complicated with malignant affections of the mucous membranes.

The florescence may be variable in duration. Sometimes it lasts only for two or three days, but it may also be seen for five or six days, and it is even reported to have totally disappeared and returned again in a few days with renewed fever.

2.) Participation of the Mucous Membranes.—The mucous membranes are much more extensively and intensively affected in morbilli than in scarlatina, and danger is more frequently to be apprehended from that source than from the morbilli poison.

The ordinary conjunctivitis may become a pernicious blennorrhœa, with severe œdema of the lids.

The nasal catarrh may give rise to such an irritation of the mucous membrane that incessant sneezing, marked congestion of the head, and exhaustion, finally ensue.

The inflammation of the palate and glottis sometimes occasions such an unceasing irritation and coughing as to cause true paroxysms, not unlike whooping-cough, accompanied with vomiting and hæmorrhage.

In malignant epidemics, it becomes more than simple congestion and catarrh of the mucous membranes. Diphtheritic membranes soon form, by which perforation of the cornea, and gangrene of the lids, fetid coryza, and salivation, may result. And, when the mouth and larynx are invaded, salivation and urgent croupous symptoms come on.

Lobar and lobular pneumonia are extremely frequent in measles, and these in particular destroy a great many children under one year of age.

The intestinal canal is much less frequently implicated in this disease than the respiratory organs; still, diarrhœa, of a very pernicious character, also occurs sometimes. The uropoëtic system, quite different from scarlatina, wherein nephritis and albuminuria are the most frequent complications, rarely becomes affected in measles. In girls, diphtheritis of the vagina occasionally occurs, which usually eventuates in gangrene of the labia and death.

3.) Character of the Fever.—Same as in scarlatina: (1), an erethetic; (2), a synochal; (3), a torpid, and (4), a septic character, which may manifest itself in whole epidemics as well as in individual constitutions. Every thing that has been said upon this point, as relates to scarlatina, is equally applicable to measles.

The erethetic form is the usual one, and has been described under "A.—*Normal Morbilli.*" None of its symptoms become grave; the eruption comes and goes at the right time, and is of moderate intensity; the affections of the mucous membrane, the fever, and the cerebral symptoms, are within proper bounds, and there follow no sequelæ of import.

When the vascular excitement becomes very considerable, the *synochal* inflammatory character is assumed. In most instances it is ushered in by a violent precursory stage. The inflammatory affections of the mucous membranes are very severe, the skin becomes burning hot, and the whole body instantly dotted with dark-red, prominent spots. The cerebral symptoms look very threatening; wild delirium alternates with profound soporific sleep. The intensely-developed exanthema, in most instances, lasts longer than four days, and may be distinctly perceived on the fifth and sixth day. The desquamation, corresponding to the preceding intense cutaneous congestion, is very marked. Consecutive affections are frequently observed.

In malignant epidemics, and in cachectic and especially scrofulous children, the torpid character of the fever is most marked and frequent. Here the precursory stage is protracted by grave symptoms, and an extraordinarily rapid exhaustion is noticeable from the very first. The patients complain of vertigo and pains in the limbs, and are fearfully anxious, restless, and sleepless. The pulse is very much accelerated, and small and easy to compress, which, with vomiting, profuse diarrhœa, and croup-like paroxysms of coughing, present a list of symptoms which, even before the eruption of the exanthema, give reason for a very unfavorable prognosis.

The exanthema itself, in this form, seldom appears at the right time, properly developed. It disappears again directly after its appearance, is only seen on some parts of the body, and never attains the usual vivid-red color.

The mucous membranes are very much disposed to diphtheritic inflammation. Profuse diarrhœa, malignant bronchitis, croup, and simple enervation, without any demonstrable morbid lesions, sometimes terminate life.

An eruption of measles, presenting the highest grade of this character, constitutes the *septic* or *putrid* variety. The eruption appears irregularly, and soon becomes complicated with ecchymosis. Coma and syncope are the most prominent cerebral symptoms. The diphtheritic mucous membrane is prone to gangrenous action, and in girls this soon extends to the vulva. Profuse nasal and intestinal hæmorrhages may soon induce a high degree of anæmia, or even scorbutic condition.

This putrid or torpid character is by no means always present from the commencement. It also happens that measles, which at first appeared as synochal, alter their character entirely, in the course of a few days, to that of the putrid variety, and, for this reason, this distinction of different forms has less accurate scientific than practical therapeutic value.

4.) SEQUELÆ.—The most frequent, and, at the same time, the most serious sequel of measles, is tuberculosis. Sometimes it develops very rapidly and intensely as miliary tuberculosis, so that the patients never recover enough to leave the bed, but continue to suffer from fever, and to cough and emaciate from the time the exanthema disappeared. Generally, however, a lengthy interval is observed between the disappearance of the eruption and the appearance of the first tuberculous symptoms. These children get up again, are free from fever, have good appetite, and the measles is forgotten. A slight bronchitis, however, has remained, and persists, in defiance of the best nursing, uniform temperature, and the numerous expectorants. Very gradually, vespertine exacerbations are noticed, followed by general indisposition, loss of spirits and strength, and with this the cough increases in severity. The emaciation becomes more and more marked, the tuberculous phenomena are soon physically demonstrable, and, in most instances, rapidly advance to a fatal termination. Their progress is rarely arrested, but, when this does occur, such children will for years be prone to bronchitis, and will often experience new tuberculous attacks. A more detailed description of the symptoms belonging to this condition is to be found in the section on pulmonary tuberculosis, page 313.

Otorrhœa is another consecutive disease, and, in most instances, is complicated with tuberculosis, and often resists the astringent treatment for many months. Impetigo and eczema of the face, and of the scalp, especially behind the ears, are also very common sequelæ. In scrofulous children, chronic inflammation of the eyes, particularly blepharitis, remains for a long time.

Sometimes the diphtheria occasions very protracted hoarseness, or a croup, which, however, in general, affords a somewhat more favorable prognosis than pure fibrinous croup.

Intestinal catarrhs likewise occur, seldom, however, become colliquative, and are quickly arrested by a judicious diet and proper astringents.

In badly-nourished, cachectic children, noma also occasionally supervenes.

The remaining lesions represented as sequelæ, such as hydrothorax, ascites, pericarditis, meningitis, etc., occur so rarely, that one is led to doubt whether he should ascribe any direct connection between them and measles.

At the autopsy, lobar and lobular pneumonia, diphtheria of the mouth and its effects, intestinal catarrh, gangrene of the vulva, etc., are found, but neither in the blood, nor in any organ, can any alteration be discovered that will furnish a clew to the nature of measles.

Diagnosis.—Measles may be confounded with *scarlatina* and *erythema.* Very many new-born children, and infants a few weeks old, are attacked by a fine punctated erythema, diffused all over the body, which differs in no respect from the eruption of measles. This is, most probably, produced by mechanical causes; the young, delicate cuticle, not yet sufficiently accustomed to the contact of the air, baths, and clothing, becomes irritated, and its papillæ inflamed and enlarged. This exanthema, in most cases, lasts for several days, vanishes, returns occasionally, but ordinarily is not complicated with catarrhal symptoms. If these accidentally happen to be present, the whole affection will not run such an exactly rhythmical course, and is not ushered in by such violent fever as ushers in measles. Moreover, erythema of the new-born child occurs without any contagion. This is particularly instructive when taken in connection with the circumstances that new-born children are far less susceptible to the morbilli contagion than older ones, and usually escape the disease, although it may be in the same house with them.

The differential diagnosis between measles and scarlet fever is occasionally attended by difficulties, especially when both diseases prevail simultaneously in the same locality. It may, therefore, prove useful if the principal symptoms and distinctive characteristics of both exanthemata are once more enumerated side by side.

DIFFERENTIAL DIAGNOSIS.

MORBILLI.	SCARLATINA.
The precursory stage lasts from three to four days.	The exanthema breaks out on the second or third day.
The most constant of the precursory symptoms are: conjunctivitis, intolerance of light, nasal and bronchial catarrh, sneezing, snuffling, hoarseness, coughing. Frequency of the pulse and the temperature of the skin but slightly augmented.	The catarrhal symptoms are almost totally absent. On the other hand, marked dysphagia is present, due to swelling of the tonsils. The fever is intense before the eruption of the exanthema.
The exanthema consists of small, roundish, red spots, slightly elevated above the skin, and only on very few places coalesce and form larger, unequally-elevated patches. It breaks out first on the face.	The eruption, in most instances, covers the entire body, or at least covers large, flat, irregular patches. It is most intense on the parts of the body of the child which are covered. It begins on the neck, and usually spares the face.
As soon as the rash has broken out, all the critical general symptoms disappear.	Fever and angina continue unabated during the florescence.
The exanthema of measles, in general, lasts somewhat longer than that of scarlatina. On the fourth day it is very distinctly seen; on the fifth and sixth it is often still present, though less distinct.	The exanthema of scarlet fever, as a rule, is completely gone on the fourth day.
Desquamation in a fine, white powder.	Desquamation in large laminæ.
Sequelæ: tuberculosis, bronchitis, inflammations of the eye, croup, and pneumonia.	Sequelæ: nephritis, dropsy, parotitis, and otorrhœa.

Notwithstanding these differential cardinal points, the diagnosis in some cases remains doubtful, and for this reason also totally unauthorized names have been invented, such as scarlatina morbillosa, and morbilli scarlatinosa.

The *prognosis*, as given in most cases, is too unfavorable in scarlatina, and too favorable in measles, for all the apparently recovered patients should not be regarded as actually cured, as tuberculosis, which very often develops after measles, and goes on unchecked, carries off many; thus, if the observation were only conducted far enough, it would be seen that the ratio of mortality is not so very favorable after all.

To repeat, very few children die during the florescence or immediately after the desquamation, especially if they have already passed the first year, but then the subsequent tuberculosis always attacks several per cent. of all ages.

Etiology.—Measles is contagious to a high degree, so that by us in Munich almost every person who is not yet impregnated with the virus is attacked by it. The contagion is extremely subtile, and no direct contact with morbilli patients is at all necessary for an infection. Occasionally it is very easy to prove its having been transmitted by a third person.

Most of the attempts at vaccination with the blood of morbilli patients, whose exanthema was at the stage of florescence, are said to have taken effect, and tolerably benign, normal measles appeared between the seventh and tenth day. But, as the process was not thereby localized, and the course being about the same as when the children have been accidentally infected, these inoculations have therefore no practical value whatever.

The contagion of morbilli does not prevail to the exclusion of all other infections. Thus varicella, small-pox, and intermittent-fever patients, have been seen to be affected with it. When scabious patients get measles the scabies usually heals spontaneously and remarkably quickly; due, perhaps, to the itch animalcule perishing by the contagion or the material alteration of the cutis.

Finally, the remarkable connection between measles and whooping-cough is yet to be mentioned. It has been observed that the contagion of one relieves the other, measles being particularly often followed by whooping-cough, and a certain relation between the two affections might readily be assumed to exist.

Treatment.—We have no specific remedy for the contagion of measles. All those measures hitherto suggested have not stood the test. Inoculation, as already stated, is not practicable, for, that which is obtained with much labor, the children usually acquire themselves, namely, normal measles. Isolation of the patients affected with measles, and all persons who have any intercourse with them, is the only sure means of preventing infection. But, during the prevalence of an epidemic, this can only be done by a change of place, and is principally indicated in pronounced cases of tuberculosis, in which measles invariably induce a rapid advance of the cachexia.

The simple and regular measles require an entirely expectant treatment. Energetic measures, such as abstraction of blood, tartar emetic, or laxatives, in many instances impede the uniform course, without removing the danger or threatening symptoms against which they have been employed.

The best protection against an irregular course and against sequelæ is a uniform, tolerably high temperature of the room, 65° F., so long as the children are in bed, 67° F. when they are about to get up. The patient should not leave the bed as long as any trace of the eruption is still to be seen, and should be confined to his room for at least two weeks, and in unfavorable seasons of the year for a still longer time, after the eruption has totally disappeared.

Heavy feather beds, under which, according to the old style, patients were kept covered up to the chin, induce too much perspiration, rendering them liable to take cold with all the greater certainty. Horse-hair mattresses and plain woollen blankets answer every purpose. It is of the utmost importance to ventilate the room thoroughly, and that can be best accomplished when the patient has two adjoining rooms for use. Children reared in a cleanly manner find it very disagreeable to pass several days without having their faces and hands washed, a management which is still prescribed by many older physicians. All the morbilli patients that I have treated were washed, face and hands, twice a day with lukewarm water, and I have never perceived the least bad effects from this practice. This useless torture, the deprivation of washing-water, should therefore be totally discarded.

The diet should be absolutely antifebrile, so long as any traces of fever are perceptible. To forbid food when the appetite has returned is cruel, and only retards the convalescence. Children never make themselves sick by eating bland, unsweetened nutriments, such as milk, soup, and wheat-bread. Where there is a disposition to diarrhœa, constipating food must be allowed; but, where constipation exists, mildly-opening nutriments and drinks should be given.

The treatment of irregular measles, of complications, and of sequelæ, is a problematical one, for no really marked effects have been observed from almost all the remedies recommended.

Measles with marked synochal, inflammatory character, tolerate very well ℈j—℈ij of nitre; serious head-symptoms in very robust, older children are very quickly subdued by a few leeches. In the torpid, nervous form, mineral acids, cinchona, and wine, are indicated. Severe cough is palliated by narcotics, belladonna, bitter-almond-water, or opium. Grave cerebral symptoms call for cold affusions of the closely-shorn head. Exanthemata that have disappeared too rapidly, or been retarded, are best treated by counter-irritants, sinapisms, and the like. Clysters with diluted vinegar have also been recommended for that purpose.

Severe diarrhœa must, in all cases, be controlled by opium and astringents; slight diarrhœa, in otherwise well-nourished children, exercises a favorable influence upon the cerebral symptoms.

The diphtheritic affections of the mucous membranes improve under the internal administration of carbonate of potassa, in large doses, at least ℈ij—℈iij pro die, and locally, so far as the parts can be reached, they should be pencilled with a solution of nitrate of silver. For real sepsis, profuse hæmorrhages from the mucous membrane, gangrenous diphtheritis, and ecchymosis of the cutis, the utmost tonic and stimulating measures, with large doses of wine, quinine, musk, and naphtha, must be employed. Washing the body with chlorine-water has also been recommended. I cannot, however, conceal the fact that, in real septic cases, all these methods of treatment have always failed me.

Pulmonary tuberculosis, which comparatively often develops after measles, may stop, like that originating spontaneously. Large doses of quinine—from two to four grains given at one time every other day—exercise a favorable influence upon its course. A year's constant use of cod-liver oil strengthens the nutrition, and perhaps, also, guards the organism against new tuberculous attacks. Country air, sea-baths, and a rational inuring, are the best prophylactics against the progress of tuberculous affections.

(3.) Rubeolæ (*Rötheln*).—There is scarcely another disease upon which the views of authors differ so vastly as upon rubeola. Some look upon it as a modified scarlatina, others as measles, and still others as an amalgamation of both. Erythema, urticaria, even typhous and cholera exanthema, have been described as rubeola; and the confusion finally became so inextricable that later writers have denied the existence of the disease entirely, and ascribed all obscure and doubtful cases to some of the above-mentioned affections. This later view I also entertained till the spring of 1865, when I became better informed. At that time eleven persons—three adults and eight children, from six months to eight years of age—came under my care. Without any distinct prodromata presented, they all had an eruption of exanthema, which differed in no respect from that of measles. My friend *Lindwurm* at the same time had five additional cases to treat, and, upon inquiries, several physicians in Munich recollected having seen at that time a peculiar fever, "a febrile urticaria with a measles-like exanthema." Neither before nor since that time have I met with this eruption. It is proper to remark that this disease was not immediately preceded nor soon followed by any epidemics of measles or scarlet fever. The phenomena presented by this affection are sketched by *Köstlin*, of Stuttgart, in the following manner: In the winter of 1860–'61 an extensive epidemic of rubeola prevailed in that city during five or six months. The exanthema was not smooth, but slightly papulous, had a yellowish tint, not confluent, but formed short or long, serpentine, seldom straight lines, which, in most instances, covered the entire body. The exanthema was not infrequently accompanied by considerable itching of the skin. The eruption, as a rule, disappeared in two or three days, sometimes even sooner. In most instances it appeared, and ran its course without the least catarrhal symptoms, and without fever. Though mild, this exanthema was extremely infectious, infecting whole families. Several children were even twice attacked during the same epidemic. It appeared at the same time in various other cities and towns in Wurtemberg.

Symptoms.—The symptoms which I have observed may be comprised in a few words. The exanthema differs in no respect from that of morbilli; small round spots of the size of lentils cover the entire body, occasioning, in most instances, a considerable amount of itching. At some places these spots stand so closely together that they coalesce and form irregular figures. They also rise somewhat above the level of the normal integument, and the finger, in lightly passing over them, perceives an unequal hardness. The eruption differs, however, very much from measles in respect to its duration. It completely disappears by the end of the first, or, at the longest, by the end of the second day, and the desquamation that succeeds it is very insignificant, barely noticeable. The same is true of the catarrhal symptoms. Although, along with an intense eruption of the exanthema on the face, the eyelids swell up, and the conjunctivæ are somewhat injected, still bronchial catarrh is uniformly absent, which, in morbilli, on the contrary, is a pathognomonic, never-failing symptom. Scarcely any precursory stage was noticeable in most of our cases, and the indistinct febrile phenomena disappeared so completely after the first day, with the fading of the exanthema which soon followed, that by the third day it was totally impossible to keep the children in bed, and they quickly recovered without the first sequela.

Treatment.—This is purely expectant. Internally, dilute acids, and, externally, cold ablutions, to relieve the intolerable itching of the skin, were the only remedial means employed in this most harmless of all acute febrile exanthemata.

(4.) VARIOLA, SMALL-POX.—Genuine human small-pox is the most positively declared of all acute exanthemata. It, however, occurs comparatively rarely, on account of the compulsory vaccination that is in force at present in almost all civilized countries, and in time will probably be totally supplanted by the milder forms of variolois, also called variola modificata, and by varicella.

By variola is understood a febrile, contagious, pustular, eruptive disease, whose course is uniform. It may be divided into several periods.

Symptoms.—Three distinct stages are distinguished. (1.) The stage of incubation and of prodromorum; (2), that of florescence of the exanthema; and (3), that of desiccation.

(1.) *Stadium Incubationis et Prodromorum.*—The period from the reception of the contagion to the eruption of the exanthema fluctuates between eight and fourteen days. The first few days of this period usually pass without any signs manifesting themselves; but in the last three days preceding the eruption severe symptoms are observed. I shall limit myself here to a delineation of the prodromata, as they occur in a child under one year, taking it for granted that a knowledge of the course of small-pox in adults has already been acquired from other sources. Small-pox now occurs only in very young children, for vaccinated persons are totally exempt from it, and by us, in Germany, vaccination is usually performed before the end of the first year.

If they have been infected a few days previously with genuine or modified variola poison, we observe slight gastric symptoms, such as loss of appetite, coated tongue, vomiting, and constipation. There will also be observed excitement of the vascular and nervous system, hot skin, frequent pulse, great restlessness alternating with stupor, starting up from sleep with an outcry, gnashing of the teeth, convulsions, and occasionally syncope, with rapid collapses. All these symptoms, which certainly have nothing characteristic about them—for the subjective pain in the back and loins, so constant and marked a symptom in adults, is not available in infants who do not speak—become aggravated throughout the next three days, regular exacerbations come on toward the evening, till, finally, the exanthema breaks out.

(2.) *Stadium Eruptionis et Florescentiæ.*—The first signs of the eruption are seen on the face; thence it spreads upon the trunk, and the upper, and lastly upon the lower extremities. The eruption is completed in from twenty-four to forty-eight hours.

The small-pox pustule has the following history, viz.: a red, slightly-elevated spot is first perceptible upon the skin, differing in no respect from the exanthema of measles. In the centre of this red spot a small tubercle develops, and upon this tubercle a still smaller vesicle appears, which enlarges very rapidly, so that on the second day it has reached the size of a pin's head; on the third, that of a lentil; and finally, the primary red point is transformed into a tense, little blister, of the size of a split pea, with a central depression.

These originally red points do not all go through this metamorphosis; a great many of them never become vesicles, but disappear entirely in a few days, especially those on the lower extremities. On the feet, in particular, the eruption is feebler than on any other part of the body.

The course of variola, as regards the form and duration of the exanthema, is precisely the same in children as in adults.

When the exanthema is not excessively diffused over the whole body, the general symptoms will subside materially after it has made its appearance. The great restlessness and delirium vanish, the pulse becomes slower and softer, the breathing more regular, but the specific variola odor is more marked after the eruption than before. Where the eruption on the mucous membrane of the eyes, nose, mouth, etc., is very abundant, no mitigation in the vascular and nervous excitement will be noticeable, for the severe pain induced by the process prevents the patients from becoming tranquil.

On the sixth day after the eruption, or on the ninth from the invasion, the suppurative fever—febris secundaria—appears also in children. The inflammatory areolæ around the vesicles become enlarged, the face swells so as to totally disfigure the patient, the skin again becomes hot, and such an intolerable itching supervenes that the child will scratch open the pustules, notwithstanding all the precautions that may be taken to prevent it. Thus it finally comes to the—

(3.) *Stadium Exsiccationis.*—It does not begin at once on the whole body; the pustules burst and dry up in the same order in which they appeared: thus, first on the face, next on the neck, on the wrists, on the trunk, and lastly on the lower extremities. Every pustule is nearly dried up by the ninth day after its appearance, or, if we include the two or three days of the prodromatory stage, on the eleventh or twelfth day of the disease all the pustules will have commenced to desiccate. Spontaneous bursting, or simple drying up without bursting of the pustules, hardly ever takes place in small children, for they cannot refrain from palliating the terrible itching by scratching or rubbing.

Thus brown thick crusts form upon the whole body, especially on the face. If left to themselves, these crusts will fall off in from four to five days, and leave behind a cicatrix covered with new epidermis, which the patients frequently scratch off. Small-pox cicatrices have the same formation in children as in adults; but, as the cutis in the former is more delicate and thiner, the destruction is therefore more conspicuous, and the inequalities, which at first appeared very marked, become less unequal in the course of years.

During this period the pustules in the mouth become converted into flat superficial ulcers, and induce an augmented mucus and salivary secretion. The secondary fever disappears with the desiccation, the appetite returns, and the recovery progresses rapidly. Occasionally the nails are cast off.

The prognosis, in children under one year of age, is extremely unfavorable, for nearly sixty per cent. perish.

The principal danger to small children is, (1), from a violent prodromatory stage, where profound stupor or convulsions endanger life; and (2), from the secondary fever, which may assume a typhous or septic character.

The quantitative and qualitative variations are the same as in adults. Here also we have variolæ discretæ, cohærentes, corymbosæ, and confluentes; in qualitative regard, variolæ crystalliniæ, siliquosæ, depressæ, cruentæ, gangrænosæ, etc.

The most frequent complications are: laryngitis, pleurisy, meningitis, intestinal catarrh, serious diseases of the eye, which frequently lead to phthisis bulbi, otorrhœa, and gangrene of the scrotum.

The most frequent sequelæ deserving to be mentioned are: furunculosis, abscesses of the cellular tissue, pyæmia, inflammations of the joints, necrosis of the bones, and, what is very remarkable in small children, scrofula in all its forms and localizations. The mortality in consequence of small-pox, in children under one year of age, is very great, for, as has been stated, barely forty per cent. recover.

Etiology.—Small-pox is contagious to a high degree, and, in fact, also infectious through the atmosphere, is communicated by contact and by inoculation. It is most infectious during the suppurative and desiccating stages. But the most important point in practice is that genuine small-pox generates small-pox in not only the unvaccinated children, *but that occasionally the mere contact with varioloid, and even with very mild varicella, may produce the genuine human variola in an unvaccinated child.*

Treatment.[*]—A prophylactic treatment is spoken of in many diseases, but in none can one be relied upon with so much certainty, and accomplished by such a simple, harmless procedure, as in variola. It is inoculation with the small-pox lymph from the cow, or

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[*] As small-pox, unfortunately, is not so rarely met with in this country as it appears to be where the author has made his observations, we deem it proper to append some remarks in regard to its pathology and treatment. At the *post-mortem* examination of small-pox, there will generally be found congestion and infiltration of the mucous membrane of the alimentary canal and some of the internal organs, especially

VACCINATION.

An eruption of pustules occurs in our domestic animals, and the pocks on the udder, in particular, have been known for a long time. Whether these always originate through contagion, or spontaneously, is not yet satisfactorily decided; their course, however, has been accurately observed. *Canstatt* reports as follows concerning it:

A few days before the eruption the cows eat less, give less milk, and the udder has an increased temperature. Soon after this, small reddish tubercles appear, especially on the external surfaces of the teats, which become converted into umbilicated pustules, and between the fourth and seventh day these have attained to complete maturity. The pustules have a pearly color, at first are filled with clear lymph, which subsequently becomes purulent, and they are surrounded by red areolæ. Touching the udder causes the animal marked pain. The pustules desiccate by the twelfth or fourteenth day, fall off, and leave circular cicatrices.

It was known for more than a hundred years that those who had to

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the brain and lungs. The serous coat of the blood-vessels seems turgid and of a blood-red color. The pustules are found scattered over the mouth, pharynx, œsophagus, and rectum, particularly if the patient have succumbed during the suppurative stage. Occasionally they are seen in the larynx, trachea, and bronchi, and the urinary bladder. Where they have ruptured, the mucous membrane will be found covered with an adventitious membrane. Each well-formed pustule, when carefully dissected, will be seen to consist of two compartments, the upper one being the larger. These compartments are both filled with pus, and communicate with each other at the marginal borders. This septum is a layer of false membrane, deposited in the derma at an early stage of the disease, which, by removing the surface-layer of the pustule, is brought into view, presenting a bright-red or purple color, and is highly infecting. But the mature pustule is multilocular, and, when a transverse section is made, presents an appearance that has been compared to a severed orange.

The urinary secretion in variola undergoes certain changes corresponding with the gradations of the disease. During the cruptive fever the quantity is lessened, its specific gravity increased, its color deep red and turbid, and it sometimes contains traces of albumen. *Becquerel* states that, "in five cases with severe symptoms during the eruptive stage, the quantity of urine was diminished, amounting on an average to only twenty-three and a half ounces in twenty-four hours. There was no increase in the specific gravity, it being only 1020.6. It frequently precipitated uric acid, either spontaneously or by adding nitric acid, and in one case only was a trace of albumen discovered." During the suppurative stage "the urine retained the synochal character so long as the symptoms continued, remaining unaltered, and, in the cases in which the fever persisted, till fatal termination. Sediments containing muco-pus also appeared in it." During the period of desquamation, "it is either normal or limpid," blood, will escape. One or two minutes are always required before a large drop appears, for the reason that vaccine pustules,* as is well known, are not simple, but multilocular vesicles. After the needle has been wiped perfectly dry, it is dipped in this lymph in such a manner that its anterior and dorsal surfaces are moistened by it. The arm of the child to be vaccinated is grasped below the shoulder, the integument on the outer surface of the upper third is made properly tense, and the point of the needle is made to pierce the skin four or five times. The punctures ought not to bleed, and the vaccination succeeds best when a minute red dot only is seen afterward. The punctures should be at a distance of at least six lines from each other, for otherwise the pustules that are subsequently to appear will coalesce.

The summer is the most proper time of the year to vaccinate, because in winter the pustules have been observed to develop very slowly. The best age is between three and twelve months. Still, when epidemics of small-pox prevail, infants may be vaccinated a few days after birth. Those children about to be vaccinated must be perfectly well, and free from any of the troubles of dentition (vide p. 106).

Vaccinated children require no special treatment. They may be washed and bathed afterward as well as before, and, from the fourth to the tenth day, the arm may be wrapped up in a fine piece of linen, merely to prevent friction. The erythema surrounding the pustules is thereby also kept within proper bounds.

The transmission of the cachexiæ from one child to another by vaccination has only been proven in regard to syphilis. Scrofula and rachitis cannot be transmitted by vaccination; but, since the most correct views do not always prevail among the public in regard to this point, and in order to avoid all future reproach, it is best to take the matter from healthy children only, and who are entirely free from cutaneous diseases.

It is well to take the precaution to have vaccine lymph constantly on hand, in order that, in case an epidemic breaks out, it should not first have to be looked for or ordered. It is collected without any difficulty or trouble in the following manner: one or several well-developed eight-day vaccine vesicles of a healthy child are punctured several times, and a few minutes allowed for the escape of the drop. It will then have become tolerably large, when an ordinary glass capillary tube held slightly oblique with its end in the drop of lymph, may be charged. The capillary tube must be held parallel with the arm for this reason, that, in case the child should stir or become restless, it will not be injured by it. I remember once to have had a child under treatment, in whom the glass tube was broken in consequence of the clumsy manner in which it was applied, the glass fragments were forced into the pustules, and a malignant erysipelas of the whole arm was the result. The little tube, according to the laws of capillary attraction, soon becomes filled with lymph, and may be withdrawn and cut off with the scissors, leaving about one-eighth or one-fourth of an inch unfilled at both ends, which are then closed with sealing-wax. In this manner vaccine lymph may be preserved in a fluid form for years.

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* European authors generally use the word pustule for the vesicular stage of vaccinia.—Tr.

When the lymph thus preserved is about to be used for vaccination, the two closed ends should be cut off with the scissors, the capillary tube is thrust into another somewhat larger glass tube, both are held between the thumb and index-finger, and the vaccine matter is blown directly upon the lancet. The vaccination is thereafter carried on as in the ordinary way, from arm to arm.

The vaccine pustule develops in the following manner: the small punctures may be seen for a few hours as minute dots. If no bleeding at all has taken place, all traces of the puncture will disappear, but, if that was the case, a few dark-brown spots will be visible for some time. On the third day after the vaccination, the vaccinated spot becomes markedly red, and a small, round, hard tubercle arises, upon the apex of which a pearl-like vesicle becomes developed by the fifth day. This vesicle daily grows in breadth, becomes distinctly umbilicated, like a variola pustule, and by the eighth day has reached the acme of florescence, when it will be seen as a bluish-red translucent pustule, surrounded by a red areola.

The pustules are constructed in compartments; their contents begin to turn turbid on the ninth day, the red areola enlarges more and more, the induration increases, the glands in the axilla become sensitive, and general symptoms supervene. The children become very restless, do not sleep at night, have a hot skin, great thirst, and are very much disposed to acute diseases, especially pneumonia and intestinal catarrhs. These general phenomena disappear in two or three days. From the eleventh day on, the red areola fades, and the opaque pustule acuminates and loses its central depression. When properly protected, it will not burst, but dry up into a brown crust, which falls off in two or three weeks, and leaves behind a white, depressed, somewhat irregular cicatrix, which, if scratched, will suppurate for a few hours, and then likewise dry up into a large crust with irregular contours.

The course of vaccination is not always so regular and simple as it has been sketched above. The secondary fever sometimes becomes so intense that life seems to be in danger. The children are attacked by severe convulsions, become collapsed, look very pale, or vomit, continuously, at first white, then bilious gastric mucus. No instance, however, has been heard of where the secondary fever brought about a fatal termination; and, when children with vaccine pustules die, some other remote cause of death will be found on careful *post-mortem* examination.

In children with a fine, irritable skin, other parts of the integument become affected; a nettle-rash or a varicella-like eruption of vesicles occurs on the whole or some part of the body. Scrofulous children are attacked by an extensive pustular eruption, in which the vaccinated arm especially participates, and then the vaccine pustules will not heal at all, but degenerate into scrofulous ulcers.

Erysipelatous inflammation of the arm is one of the worst complications which, through rough treatment of the pustules, particularly in cachectic persons, may develop between the ninth and twelfth day. The erysipelas spreads over the entire arm, even over a part of the trunk, the fever is intense, recovery progresses but very slowly, and the pustules ulcerate.

A too rapid and a too slow formation of pustules may be mentioned under the head of anomalies of the local course. If the vaccine lymph was poor, obtained from an imperfectly-developed pustule, small vesicles will form as early as the second or third day, will be but little umbilicated, barely attain to the size of a lentil, and dry up in six or eight days. On the other hand, as a rare anomaly, instances are related in which the eruption has been materially retarded, and the period of incubation was eight to ten days. I cannot remember to have observed a single instance of this kind in the many hundreds of cases that I have had the opportunity of vaccinating.

As a real sequela of a vaccination which has been performed with all due caution, the sudden breaking out of scrofulous affections only need be mentioned. This occurs in children the progeny of tuberculous parents, and they are often attacked with remarkable rapidity and vehemence.

The question, How long a time does vaccination serve as a protection against variola? has been considerably ventilated, and the investigations that have been instituted for the purpose of solving this question have finally led to the general establishment of a revaccination at the time of puberty. Whether it is assumed that vaccination protects for life, or only for ten or twenty years, it is, at least, certain that children who have had proper vaccine pustules are totally protected against genuine variola. Hence vaccination is to be looked upon as a great blessing to humanity, in which light also the Parliament of England regarded it, and, in gratitude to its discoverer, voted him a national gift of thirty thousand pounds sterling.

If the genuine or modified small-pox breaks out in a family in which one child is not yet vaccinated, this child should be vaccinated as quickly as possible, so as to mitigate the course of the exanthema, which usually breaks out notwithstanding. The vaccine and small-pox pustules then run an undisturbed course together. Still, it has been observed that, when vaccinia anticipates the general exanthema, the latter assumes a less dangerous character.

The treatment of small-pox is to be conducted in as expectant a manner as scarlet fever and measles, being directed to the symptoms as they occur. The ventilation of the room should be carefully looked after, the temperature should be 58° F., and all weakening measures, such as abstraction of blood, calomel, and cathartics, must be absolutely avoided. When intestinal catarrh is present, as is usually the case in children under one year of age, it need not be interfered with so long as it is moderate, as the cerebral symptoms are thereby visibly mitigated; but, so soon as it threatens to become profuse, an attempt is to be made to control it by small doses of opium, one drop of the tincture every three or four hours.

With the *breaking out* of the pocks, the indication is to prevent the development of the pustules in the face, and with it the formation of cicatrices, which so frightfully disfigure the patient. All the remedies recommended for that purpose are sadly deficient in many respects, and perceptible cicatrices result, notwithstanding all manner of treatment. An early cauterization of the pustules, which, according to *Bretonneau*, is performed by dipping a pointed gold needle in a concentrated solution of nitrate of silver, and then puncturing with it every young pustule, is the surest remedy.

If the pustules are thus cauterized on the second day of the eruption, they will be arrested in their development; and the integument in a few days becomes elevated by a thin crust, and, after it has fallen off, no deforming cicatrices will be perceptible.

But this cauterization is painful, and, in confluent small-pox, requires much time, owing to which this treatment has been limited to the eyes, eyelids, and nose, while the other parts of the face, the forehead, cheeks, and chin, are covered with mercurial plaster. It must be changed every other day, and should be discarded altogether if the pustules have become developed notwithstanding. One portion of the pustules, no doubt, is arrested and destroyed by this treatment; another does not attain to a proper, extensive development, and very few only leave permanent, disfiguring cicatrices.

Lotions of corrosive sublimate, chlorine-water, and painting the face with iodine, have also been recommended.* The general management after the eruption is limited to an antiphlogistic diet, to keeping the bowels open, and, when the restlessness is very great, to the administration of small doses of opium.

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* Prof. J. Hughes Bennett recommends the following mixture: carbonate of zinc, three parts; oxide of zinc, one part, rubbed in a mortar with olive-oil to a proper consistence.—A solution of gutta-percha in chloroform is equally as efficacious as the

The utmost attention will be required during the periods of suppuration and desiccation, to prevent the patients from scratching themselves and prematurely tearing off the crusts. Linen mittens, secured at the wrists, will be found to be of great benefit. Starch, powder, or a liniment of lime-water and olive-oil, is very efficacious in assuaging the itching of the skin. The patients should not leave the room till the crusts have fallen off, and the new cicatrized skin begins to turn white.

If the fever has assumed a torpid, septic character, nervines and tonics should be plentifully administered, such as have already been described in detail in the therapeutics of scarlet fever.

(5.) MODIFIED SMALL-POX, VARIOLOID AND VARICELLA, CHICKEN-POX.—Both physicians and the public had been familiar with a mild form of children's disease, known by the names of varicella and chicken-pox, long before vaccination was discovered. But there is a long list of gradations between this lowest step of development of small-pox and the most perfect form of confluent variola, all of which have been comprised under the name of varioloid, or modified small-pox. To regard them as exanthemata capable of existing by themselves, without any direct connection with genuine small-pox, is not very proper, for the simple reason that it has often happened that unvaccinated patients, with mild varicella, were attacked by the severest forms of small-pox; and, conversely, that vaccinated persons, through contact with patients having genuine small-pox, acquired only varicella.

Nevertheless, it is advisable, in order more easily to comprehend these affections, to retain the old denominations. Both of these certainly not very distinctly-defined forms of disease, *varioloid* and *varicella*, will therefore here be separately considered.

Symptoms of Varioloid.—The same stages may be observed in varioloid as in variola, but they are all of shorter duration, and less sharply defined. The entire duration of variola, from the invasion of the prodromata until the desiccation of the pustules, embraces a period of from sixteen to eighteen days, that of varioloid from seven to eleven days.

The prodromata are the same as in variola, but usually do not last three full days, twenty-four to thirty-six hours at the most, and are less intense in general. The specific smell of small-pox is totally absent in varioloid; on the other hand, a dark-red, large-spotted erythema of the integument, which has been described by the name of

preceding remedy. And, of late, carbolic acid has also been recommended for the same purpose.—TR.

"rash," supervenes, a sign not usually seen in variola. This erythema is not to be regarded as the commencement of the pustular eruption, for the pustules that subsequently develop may appear upon the parts of the body which the rash has not invaded.

The exanthema breaks out more rapidly and less uniformly. The eruption does not begin on the face alone, nor does it descend gradually upon the trunk and the lower extremities, but appears almost simultaneously upon the whole body. Whereas, in variola, all the pustules on one part of the body are at an equal stage of development, and no new accessions are noticeable; while, on the contrary, in varioloid tubercles, vesicles and large pustules are usually found alongside of each other, and the number of the pustules increases for several days. While it is true that solitary pustules, which, in regard to form and structure, differ in no way from those of genuine small-pox, occur in varioloid, the majority of them, however, do not become umbilicated pustules, but remain hyaline vesicles of the size of hempseed, and desiccate into correspondingly thin scabs.

The general symptoms, which were very slight from the commencement, either disappear entirely with the eruption of the exanthema, or are, at least, reduced to a minimum. No real secondary fever occurs in this disease, and the patients, in most instances, feel so well that they can hardly be kept in bed. Even the most developed pustules begin to dry up by the fifth or sixth day at the latest, and occasionally a few solitary followers are observed in the midst of the drying ones, but they only become vesicles, and usually, as such, soon perish. The suppuration of the pustules never becomes so intense as to produce an erysipelatous redness around them, and but few of them ever burst. They usually dry up quickly, the crusts fall off in a few days, and leave behind them slightly-red, barely-depressed cicatrices. The pustules on the mucous membrane of the mouth and pharynx heal in an equally short time.

Sequelæ are rare in varioloid, and attended by little danger in previously healthy children. Occasionally an obstinate furunculosis, or a profusely suppurating impetigo, follows. The latter is generally attended by swelling of the adjacent lymphatic glands. In most scrofulous children the various cachectic affections make very rapid progress.

The *prognosis* is more favorable than in variola, for, of children under one year, only eight to ten per cent., and of older ones from five to six per cent., perish.

The danger especially to be apprehended is from a participation of the larynx, through which croup-symptoms and sudden œdema of the glottis are occasioned. Convulsions which have a tendency to a rapid fatal termination, complication with pneumonia or meningitis, and finally a septic character of the fever that exceptionally becomes developed, are among the recognized sequelæ.

Treatment.—Vaccination offers *no* protection against varioloid, as it only modifies the contagion of genuine small-pox to such an extent that, when communicated to a vaccinated child, it at most produces varioloid. But, since it has often been observed that varioloid runs a milder course in a vaccinated child than in one that is not vaccinated, vaccination must therefore, in this respect, also be looked upon as a beneficial prophylactic.

The treatment of the disease that has already broken out is purely expectant. Every thing that has been said with respect to variola is applicable to varioloid. No cauterization of the pustules on the face is necessary in this case, for the pustules penetrate less deeply into the cutis, and only leave superficial pittings. Disfiguring cicatrices of the face, as a rule, may be readily prevented by the aid of mercurial plaster.

In the early stage of the disease it is best to give some diluted mineral acid; if diarrhœa be present, mucilaginous remedies. In laryngeal croup, the greatest benefit is derived from intense cauterizations of the pharynx, larynx and epiglottis, with a concentrated solution of nitrate of silver (ʒ ss to water ℥ j). These cauterizations are easily performed; but, in order to be convinced that the contents of the cauterizing sponge find their way into the larynx, the index-finger of the left-hand should first be thrust quickly far into the mouth of the child, the epiglottis raised up, and the sponge then rapidly pressed into the glottis. The head of the child should be held firmly and steadily by an assistant. This procedure always requires a certain amount of dexterity and practice. In children who have teeth, it is advisable to protect the last joint of the index-finger with some lint, before it is introduced into the mouth, for they are very apt to bite it severely.

In small children, the immoderate amount of scratching during the desiccating stage may be prevented by the aid of linen mittens; older children, naturally, are much offended and annoyed by this procedure. In the latter, the nails, at least, should be cut off as short as possible.

Convalescence usually progresses rapidly, and a special tonic after-treatment will but very seldom be required.

Symptoms of Varicella.—Varicella, also called false, chicken, water, swine, or stone pox, is the least dangerous, the most insignificant of all exanthematous affections, and the majority of cases, especially during the prevalence of an epidemic, do not come at all under medical supervision.

Hardly any precursory signs are observed in large and otherwise healthy children. Occasionally slight gastric symptoms, vomiting, loss of appetite, stomach-ache, mild febrile phenomena, and urinary difficulties, precede the eruption of the exanthema for one, at the most two days.

The exanthema, without any particular aggravation of these prodromatory symptoms, now breaks out simultaneously upon different parts of the body without any apparent order. In from six to twelve hours small red spots grow into vesicles of the size of lentils or peas, which, regarded by themselves, cannot be distinguished from small blisters produced by a burn. Most of them are circular, or slightly oval and unilocular, and when punctured the entire contents escape at once. They are not at all, or but slightly, umbilicated. The majority of these vesicles are found upon the back and breast, a few upon the extremities, and the least upon the face, one or two pustules only appearing on the forehead.

Usually it is not completed by one eruption, but a second crop of vesicles appears on the next day, and then we have fresh and totally-dried varicella vesicles alongside of each other. Although most of the vesicles are not larger than a lentil, several pustules are found in all varicella patients, upon the forehead or back, which are slightly umbilicated, and resemble the genuine variola pustule.

The course of most of the vesicles is very rapid. Their contents become turbid as early as the second or third day, and dry up on the fourth; flat, bloody crusts then form, which fall off in a few days, and leave no pitting, but a red spot. The narrow red areolæ which formed at the time the vesicles became opaque, disappear as soon as the crusts have desiccated.

The red spot, which for several weeks indicates the former site of the crust, is not to be seen after this time.

Unless accessions of vesicles particularly protract the course, the whole disease, with the exception of the red spots just mentioned, marking the site of the pustules, is entirely completed in from eight to ten days. These red spots will remain for some time thereafter. No sequelæ are observed in this affection, but, in scrofulous children, chronic suppurating eruptions sometimes develop directly from the vesicles and resist for a long time the desiccating treatment. Varicella regularly terminates in rapid recovery.

The variations of ordinary chicken-pox described in medical literature are: varicellæ lenticulares, where none of the vesicles are larger than lentils, and not umbilicated; and varicellæ coniformes, or acuminatæ, the so-called horn-pox, where hard tubercles form at first upon the skin, on which small acuminated vesicles originate the next day. The vesicle dries very quickly, and its indurated base shrinks by repeated desquamations.

If we are to recapitulate the essential differences between varioloid and varicella, we will find that varicella, in contradistinction to the former, has but a short or no precursory stage, that the exanthema appears in a perfectly orderless manner, and is followed by many accessions, the face being almost wholly spared; that it dries up in two or three days and leaves no pitting. No danger to life, nor any permanent injury, is to be apprehended from varicella. Vaccination and genuine small-pox do not serve as protection against varicella.

Treatment of Varicella.—If an expectant treatment has been pronounced sufficient for varioloid, it is of course still more so for varicella. When the children are free from fever, as is usually the case, it is a difficult task to put them in bed. Nor is it absolutely necessary to keep varicella patients in bed, for no bad effects are usually seen, even when they are allowed the utmost freedom, and expose themselves to great changes of the temperature.

Where febrile prodromatory symptoms are present, some mild laxative, such as tamarinds or neutral salts, may be prescribed. The pustules should be pencilled over with a little oil or cocoa-butter; the patients are, for a few days, put upon a bland vegetable diet, and kept in a room of uniform temperature. The disturbed activity of the skin is remedied by three or four lukewarm-water baths after the crusts have fallen off.

(6.) ERYTHEMA NEONATORUM.—Besides the physiological red discoloration of the skin, with which all normal children come into the world, and which, after a few days, becomes yellowish red, and finally bright red, an erythema papulosum also very frequently occurs in newborn children.

Symptoms.—The erythema is usually most strongly developed upon the breast and back, and consists of small, dark-red pimples resting upon an equally red base. The cutis is but slightly infiltrated; itching of the skin seems to be present, for all the patients are uneasy so long as the exanthema is visible. On pressure by the finger the redness quickly disappears, but returns again in an increased degree as soon as it is removed. The erythema fades in a few days, and the darkest spots desquamate in very thin scales.

There is nothing typical whatever to be observed in its whole course, and the entire process is sometimes completed in two, sometimes again in fourteen days. The child may also be attacked by it more than once. Hardly any general symptoms are occasioned by it, the children have no fever, the mucous membranes do not participate in this affection, and the appetite is not disturbed, which fact alone sufficiently distinguishes this erythema from scarlatina and rubeola. The exanthema itself, certainly, has the greatest resemblance to scarlatina, and, but for the accompanying symptoms, might be mistaken for this exanthema. It is a fact worth remembering, that new-born children are but little predisposed to take scarlatina.

Etiology.—The causes of this erythema, most probably, are external, from the circumstance that these children are attacked by it in the first few days of life, and from its repeated occurrence in one individual. Indeed, the delicate skin does not tolerate, from the very first, the irritation of the garments and baths, and is thereby excited into a high degree of hyperæmia, which constitutes erythema papulosum.

Treatment.—Since erythema expires spontaneously in a short time, its treatment may be simply expectant. The skin should not be rubbed nor irritated so long as the erythema exists, especially after the baths, which need not be omitted even for one day. The patients, however, should be simply wrapped up in dry cloths, and all rubbing avoided. Mild infrictions of ol. coccos, or some other pure oil, seem to be soothing to these children. During this period their underclothes and diapers should be as fine and soft as possible.

(7.) ERYSIPELAS.—In children of from five to fifteen years, erysipelas, which differs in no respect from that of the adult, occurs, and it consequently deserves no further consideration here. But erysipelas of the new-born child and nursling presents such important modifications, especially symptomatically and prognostically, that it seems to call for an especial description.

This kind of erysipelas is distinguished by a great and constant disposition to migrate, not limiting itself to any small or large portion of the body, but creeping over the *entire* surface of the skin. Adjacent parts are constantly attacked, while those previously affected fade gradually, and the disease is not arrested until the whole surface of the body has been implicated. In exceptional cases the pernicious process is not content with even this, but begins anew, at some place, and again wanders over a greater or less portion of the body.

The local symptoms do not differ from ordinary erysipelas—redness, swelling, warmth, and pain on pressure. The exanthema remains in its florescence from one to three days, and fades remarkably quickly as soon as it has attacked new parts.

The whole course, in the rare cases of recovery, lasts from four to five weeks. New-born children invariably succumb to it in a few days, and even infants several months old only recover very exceptionally.

Etiology.—In new-born children erysipelas almost always starts from the navel, and is especially often observed during an epidemic of puerperal fever, when, in fact, the navel never cicatrizes normally. In older children all possible injuries of the skin may supply a cause for this disease. Erysipelas most frequently follows vaccine and impetigo pustules, but may also take its rise from a simple abrasion (intertrigo) of a cutaneous fold. But the great frequency with which these cutaneous excoriations occur on the one hand, and the rarity of erysipelas on the other, render a positive disposition to erysipelas necessary to account for its appearance in these cases.

Treatment.—All attempts to localize erysipelas, to prevent its spreading, have hitherto proved futile. Even ferrum candens (the actual cautery) has been tried, but has proved ineffectual to check the progress of the inflammation.

The internal treatment at any rate must be by tonics and stimulants. The English physicians claim to have derived benefit from tr. ferri muriatici oxid. in two-drop doses every hour. In the few children whom I have seen recover from erysipelas, I administered from two to three grains of quinine daily for several days, and a teaspoonful of Bordeaux brandy every hour for several weeks. Locally ol. coccos was only applied.

(8.) INTERTRIGO (CHAFING).—By intertrigo is understood a destruction of the epidermis covering the opposing surfaces of a cutaneous fold, resulting from the rubbing of the two surfaces against each other. It is seen most frequently between the nates, in the groins, the armpits, and on the neck. Corpulent children, moreover, may become chafed on all the cutaneous folds of the body, though otherwise possessing excellent health, and having the best attention; in lean children this only happens when the diapers, soaked in diarrhœal excretions and urine, are allowed to remain in contact with the skin for some time.

Redness and moisture of the affected integumentary folds is the first degree of intertrigo. The epidermis next softens, and may be wiped off as a white mucus, when the cutis will be seen totally exposed, dark-red in color, and painful to the touch. The secretion, that now becomes considerable, may increase in amount sufficiently to form crusts. With cleanliness and proper treatment, the loss of epidermis is soon repaired; but where the subjects are cachectic or atrophic, and if the primary cause, the diarrhœa, continues, the erosions will assume an ulcerative form, may become coated with diphtheritic membranes, and in the worst cases even gangrenous.

The ordinary intertrigo of corpulent children, under an appropriate treatment, disappears in two or three days, that occurring in atrophic children never heals so long as the diarrhœa lasts.

Treatment.—As a prophylactic in corpulent children, *semen lycopodii* is very advantageously dusted in the cutaneous folds; it prevents the rubbing and contact of the surfaces, and by its feeble hygroscopic properties preserves them dry for some time. Usually, it is also employed by the laity as a remedy in cases where the epidermis has already been lost, but here it is altogether out of place. The secreted exudation combines with the lycopodium, forms hard, large crusts, and considerably increases the inflammation of the skin. Where this injudicious measure has been employed, the crusts are first to be soaked off with oil, and carefully removed. The existing excoriations are best treated with lead or zinc ointment, and, among the poor, ordinary tallow may be substituted for these remedies. Tepid baths are the best preventive against chafing.

(9.) FURUNCULOSIS.—Children of various ages frequently suffer from solitary furuncles or boils, which, corresponding with the more rapid metamorphosis of the tissues generally, comparatively quickly cast off their core and soon heal up. But, in children the progeny of tuberculous parents, the case is totally different.

In the latter, large numbers of furuncles occasionally occur on the occiput and over the entire head, come on one after the other, break, and cause the child great suffering for a long time. Usually no firm core is expelled, as in the simple phlegmons, the contents consisting only of thick, yellowish, or bloody pus, which often becomes agglutinated with the surrounding hairs into thick flat crusts.

Coincident swelling of the glands of the nape of the neck occurs; they are very painful to the touch, and, in fact, now and then suppurate.

These furuncles may become so numerous that the whole occiput is finally covered with a mass of confluent crusts, under which new ones constantly appear, elevate the old crusts, and, by the discharge of their contents, assist in thickening it. In this manner the extremely painful process is protracted for many weeks. Young children hardly sleep at all, but older ones, when the nurse takes them upon her arms, where they can then lay their face upon her shoulder, are able to sleep. Finally, the crusts dry up, and no accessions follow. The scabs become loose and may be removed, together with the hair, or what there is left of it. The marks of the phlegmon may be recognized for some time after by the bluish-red, glistening cicatrices. The consecutive swelling of the cervical glands also disappears. The nutrition and development of the children, from the constant sleeplessness, suffer in an extreme degree; but, if the digestive organs are not attacked by catarrh, they will rapidly improve after the furunculosis has been cured.

In perfectly healthy children this disease is scarcely ever observed; but ordinarily it is the harbinger of a long list of scrofulous affections.

Treatment.—This affection cannot be cut short. The only thing the physician can do is to attempt to remove the constant restlessness and sleeplessness, by which a great service is rendered to the patients and their relatives. This is very easily done by one or two drops of laudanum, by which a few hours of refreshing sleep are induced, even in the most restless children. No bad effects are ever seen from this moderate use of opium.

Locally, the crusts are best treated with some oleaginous substance. Simple cerate, or some mild ointment, is applied daily until the crusts soften and fall of. By these measures, the painful pulling of the agglutinated hairs is avoided. No relief is obtained from prematurely opening the boils, and it is best, therefore, to wait until they are sufficiently large, and the apices have become yellowish, when they may be punctured with a needle. By this means the painful tension and several hours of pain may be avoided.

(10.) SCABIES—ITCH.—Since, in the composition of this chapter, a knowledge of the diseases of the skin in general is presupposed, I may appropriately omit a zoological description of the itch animalcule, and immediately proceed to speak of the morbid alterations of the skin produced by it in small children. The best description and representation of the acarus scabiei are to be found in *Simons's* Diseases of the Skin, and *Küchenmeister's* Parasites.

Symptoms.—The acarus scabiei penetrates, with especial preference and remarkable rapidity, the delicate epidermis of the nursling, and, a few days after the infection has taken place, the consecutive exanthema begins to appear. In young children this varies according to their age. Very young infants, a few weeks old only, have it in a less degree, because they are still unable to scratch themselves so severely, while those a few months old become universally covered with it.

Generally, the exanthema is most developed upon the hands, buttocks, and abdomen, and at first presents the following form: A rose-colored papule originates upon various parts of the body, and upon their apices small transparent vesicles become developed, accompanied by intense itching. When these vesicles remain uninjured, their contents in a few days will become opaque and purulent, and thus form pustules which burst spontaneously, and leave behind them a yellow circular crust. But, if the vesicles are prematurely scratched open, as is usually the case, then these irritated spots will bleed a little, and the small crusts that then form are of a black color.

The more the children scratch, the more extensive will become the exanthema. By the coalescence of single pustules, large ulcers often form, especially on the lower extremities and on the buttocks. These ulcers resist the treatment for a long time, and, in chronic cases, the whole skin, even those parts of it that are free from pustules, assumes a dry, scabby character.

The state of the general system of small children is much affected, in consequence of the incessant itching and sleepless nights, and they become visibly emaciated if the scabies is not properly treated, which is, unfortunately, often the case even at this day.

As regards age, new-born children are the only ones exempt from it, for the reason that the animalcule requires several days to penetrate the epidermis, and to produce the exanthema. Not until this has taken place do we become aware of the course of the animalcule, for, previous to that, there is, in most instances, no cause for examining the integument with great attention. Infants a few weeks old are very susceptible to the itch, and generally acquire it if any child has introduced it into the house.

Scabies is more difficult to diagnosticate in children than in adults, because the animalcule has not, as in the latter, a preference for the hands, but burrows its passage (or cuniculus) at any point in the body. As only a single one is generally found at a time, it is often necessary to search for a long time before a characteristic cuniculus can be discovered. The discovery of these cuniculi is rendered still more difficult by their remaining perfectly white, and differing but slightly from the normal skin, while those on the hands of adults soon become dirty blackish in consequence of the different location, and cannot be made white by simple washing, the dirt that has found its way beneath its epidermis remaining entirely unaffected by the water. In young children these tracts are most frequently found upon the skin of the abdomen and buttocks, also on the face, a condition which is never observed in adults. The attendant exanthema is always more extensive and severe in the former than in the latter.

Older children, with a fine, delicate skin, sometimes have excessively large pustules, which may reach to the size of a split pea, or larger. When these are punctured, a large drop of pus escapes, and, generally, the pustules fill again several times if their contents are evacuated by repeated punctures. Most of them leave a dark-colored cicatrix, which is visible for a long time. This large pustular eruption has also been called *fat scabies* (fette Krätze).

The course of scabies in children is always very tedious, and may be prolonged for months if proper treatment be not adopted. In addition to that, the pustules and excoriations constantly become larger, and more numerous, the restlessness still greater, and the emaciation makes alarming progress. Finally, when almost the entire skin is covered with thick scabs, a spontaneous improvement seems to ensue even without any treatment.

Therapeutics.—The treatment of scabies in children is essentially different from that proper in the adult, and varies according as to whether the consecutive eruption consists only of papules, or also of pustules and ulcers. In infants who are still unable to scratch themselves, it is usually only papulous, and, in such cases, the rapid-cure may very advantageously be employed.

The whole body of the child, with the exception of the face, is rubbed over with green soft soap, and, half an hour after that, the child is placed in a warm bath, in which the soap is soon dissolved. After it has been carefully wiped dry, the old Helmeric ointment, consisting of one part of carbonate of potassa, two parts of sulphur, and eight of fat, is likewise smeared over the entire body, and, if possible, should be allowed to remain upon the skin for twenty-four hours. But, if the latter becomes more severely inflamed, and the child very restless, the ointment should be removed before the expiration of that time by a second bath. It is hardly necessary to mention that all the garments and bedclothes must be changed, and thoroughly purified with lye. Sometimes the scabies disappears completely with the first infriction; in most instances, however, this procedure will have to be repeated two or three times. This is always advisable as a precautionary measure, and may be the more readily executed, as the patients are but little annoyed by it.

The circumstance is entirely different when the skin is very much irritated by scratching, and extensive pustular or ulcerating sores have formed. Here the green soap produces the most excruciating pains when applied to the denuded or ulcerated cutis, and œdema and erysipelatous inflammation on some parts of the body may be the result. This remedy consequently cannot then be employed. Also the Helmeric ointment, on account of its containing carbonate of potassa, may have to be omitted, for the skin may be too severely irritated by it. In such children we have to content ourselves with an ointment, consisting of one part of f. sulphur, and four parts lard, rubbed in daily after each bath, and change of the garments daily. It will be found that, even by this mild treatment, the itching of the skin will be subdued, the pustules heal, and no accession occur.

Particularly high temperatures, as is still prescribed for scabies wards in some hospitals, conduce but little to a rapid recovery, and have the great disadvantage that the patients thereby become debilitated and disposed to contract colds.

In the treatment with the simple sulphur ointment, I allow the children, during the pleasant seasons of the year, to be out in the free air the whole day.

That no favorable result will be attained in families, where several members suffer from scabies, unless all of them are simultaneously subjected to the treatment, is of itself understood. In the lower classes of people, where a sufficient change of linen cannot be commanded, and the procuring of the baths is too expensive, the chances of a speedy recovery are very small, and the little patients will not get better until the older members have undergone a thorough treatment in some hospital.

(11.) CONGENITAL NÆVI—MOTHER'S MARKS.—As nævus vasculosus, varix, telangectasis, have already been treated of in connection with the diseases of the vessels (page 242), it only remains for us to describe here the congenital pigmentary nævi, moles, and congenital adipose tumors.

By pigmentary nævi, stigmata, spili, spots on the skin are understood, which are round or irregular in form, yellow, brown, black, or gray in color, and vary in size from a pea up to the palm of the hand, and, in some instances, cover even a large part of the body, the whole back, or an entire extremity. The alteration of color is due to a deposit of pigment in the Malpighian net-work. On these places the skin is sometimes hypertrophied and uneven, so that the mole projects somewhat above the sound skin, and occasionally is profusely studded with hairs, by which it is made to resemble the brown fur of an animal. The pigmentation is not always distributed alike over the whole nævus; sometimes the centre, sometimes again the periphery is brighter. These pigmentary moles never become enlarged, except in proportion to the growth of the body in general, and occasionally they remain exactly of the same size as at first.

By *warts* are understood higher prominences of the skin, produced by an elongation of the papillæ, and the formation of new tissues; these are usually of a brown color. These warts that so frequently originate later in older children differ essentially from these under consideration. The former consist of a number of perpendicular prominences of the elongated papillæ of the skin, which are covered by an indurated layer of epidermis. They are not pigmented, develop themselves on the different parts of the hands and face, and after several months disappear, without leaving any traces behind, and for this reason have become such desirable objects of attention for the so-called sympathy-cure, stupidity, and imposition. The congenital warts, first described, never disappear spontaneously.

By *congenital* adipose tumors, we understand roundish or cylindrical fatty growths, covered with normal skin, most of which are pediculated, but sometimes seated upon a broad base. Strictly speaking, they do not belong to the diseases of the cutis, for the skin is entirely unaffected, but they are due to an abnormal exuberation of the subcutaneous adipose tissue. These usually enlarge in proportion to the growth of the body, but in some cases also faster.

Therapeutics.—In regard to the total or partial extirpation of these various moles, and the cautions that are to be taken into consideration in the operation, according to their situation, we refer the student to the standard works on surgery. In small nævi, surgical procedures may frequently be avoided by performing vaccination upon them. The punctures, with the vaccinating needle in these cases, must be made so close to each other that the pustules resulting therefrom will coalesce.

By the seventh or eighth day the whole nævus rises up as a high, painful pustule, which suppurates for a long time, and frequently ulcerates; ultimately, however, heals, and leaves a rose-colored or white eschar. Although, in large moles, this process is not capable of destroying all the pigment, still it serves to divide them into small islands, which, by subsequent operations, may be removed with greater ease.

In children who are already vaccinated, deep pustular ulcerations may be produced by a continuous local use of tartar. stibiat., or corrosive sublimate, in the form of a paste or ointment; and, by the time these pustules heal, the whole mole will be found destroyed. At least, the hair-follicles, in those moles that are covered with hairs, are destroyed by this means, and their disfiguring appearance is thereby considerably diminished.

In the simple, non-congenital warts of older children, which start up in a crop in various places at the same time, all surgical measures, cutting, and cauterizing, are totally unnecessary, for they disappear spontaneously in the same manner they appeared. The internal use of small doses of alkaline carbonates, or of carbonate of magnesia, is said to accelerate the disappearance of these warts.

(12.) Burns (*Combustio*).—Burns very often occur in children, in consequence of their ignorance and carelessness; but, when a child has once burnt itself severely, there is little danger of the repetition of the accident. This fact has become proverbial, that "a burnt child dreads the fire." Most frequently the children burn themselves about the upper extremities and face, ordinarily on hot utensils, or with hot liquids, milk, water, or soup. The severer grades of burns, characterized by total or extensive destructions, with the formation of scabs, are for this reason rare. We seldom see any thing more than the formation of blisters.

Suppuration, however, is also severe and protracted even after this inferior grade of burns, and the cicatrices are very much disposed to become contracted. In extensive burns, a severe reaction and violent fever come on as early as the second day, and in nervous children these will be accompanied by convulsions. Usually the general symptoms are not very violent, and, under proper treatment and position of the burnt part, disappear after a few days.

Treatment.—The local treatment is conducted according to the degree of the burn. The pains of *simple erythematous burns* are most quickly allayed by inunctions of lard and covering the part with cotton wool. Cold is advisable only in very small erythematous burns; in extensive burns, on the contrary, the most experienced surgeons, such as *Walther*, *Nussbaum*, and others, consider it dangerous.

Large *blisters* should be punctured with a fine needle, and the serum allowed to escape, the epidermis, however, should not be removed, for it assists the process of cicatrization better than any kind of plaster. The best results in these cases are derived from pencilling the part with a concentrated solution of nitrate of silver (ʒ ss to water ℥ ss). But this remedy causes too intense pain where the cutis is denuded. When suppuration has set in, simple cerate and subsequently lead-and-zinc ointment may be used. Any two opposite surfaces when denuded of their epithelium, for example, between the fingers and toes, should not be allowed to remain in contact with each other, but should be carefully kept apart by interposing pieces of adhesive plaster or lint smeared with cerate.

The diarrhœa which sometimes comes on in extensive burns should be controlled by opium. The treatment of the general symptoms should be antiphlogistic. For the continuous restlessness and sleeplessness, opium is, once more, the sovereign remedy.

In deep burns of the hands and arms, marked contractions of the tendons result from the cicatrizations, and an effort should therefore be made, by the aid of counter-extending apparatus, to prevent them.

(13.) CONGELATIO, FROST-BITE, CHILBLAIN.—So long as children are unable to walk, freezing of the extremities does not readily occur. But, if they are exposed for a long time at this tender age to a low temperature, general cyanosis comes on, and they very quickly fall asleep to wake no more. Indeed, this criminal practice is probably performed oftener than the authorities become aware; for it is scarcely possible to prove it by a post-mortem examination.

In winter, chilblains are of very frequent occurrence in older children who play a great deal in the snow, and have little respect for cold and wet feet. Here, as in burns, three degrees are distinguished. First grade: redness, slight swelling, itching and pricking, especially in chilblain. Second grade: bloody blisters, which in part originate through the influence of cold but in part also from pressure of the shoes, and therefore occur predominantly on the heel and toes. Third grade: gangrene of the skin or of entire extremities. The first two are the principal grades which occur in children.

Treatment.—Gelatio of the first degree, when still fresh, is best treated by rubbing it for a little while with snow. If it has already existed for some time, it is no longer possible to remove it quickly, and the evil, as a rule, is too slight to make it necessary to subject the children on that account to a treatment of several weeks' duration. Chilblains usually disappear spontaneously as the spring of the year sets in. The greatest benefit has been derived from pencilling the parts with a solution of nitrate of silver or iodine, especially where the itching is intolerable. Various kinds of fat and ointments, equal parts of tallow and brandy, etc., and particularly cabinet-maker's glue, from which some very striking effects may sometimes be seen, are some of the most popular remedies.

The active discolored ulcers which originate from the bloody blisters of the second grade, resist the treatment for a long time. It is frequently necessary to cauterize them, and to treat them with digestive ointments until healthy granulations appear on a level with the skin. All pressure, of course, must be avoided.

These are the most important diseases of the skin which in form or treatment vary from those of the adult. All others, for example, favus, icthyosis, pityriasis, lichen, zoster, urticaria, peliosis, etc., are similar in character to those of the adult, and for this reason merit no further attention here. Some of the cachectic cutaneous affections will yet be specially treated of in the section on scrofula and syphilis.

The original plan of this work was, that it should also contain a chapter devoted exclusively to the diseases of the organs of locomotion, of the bones and muscles. But on more accurate examination it was seen that the greater part of them require purely surgico-orthopedic relief, and the specialists who have written upon this subject have already produced a very extensive literature. We would, therefore, have to be either very minute or content ourselves with merely furnishing a a simple extract from the writings of the later surgeons and numerous orthopedists, and for that reason prefer to refer the student at once to these authors. To this chapter would belong defect and malformation of the hands and feet, talipes equinus, varus and valgus, curvatures of the spinal column, traumatic luxations, and fractures.

The morbid alterations of the bones produced by scrofula and rachitis will be described with the cachexiæ.

CHAPTER VIII.

GENERAL DISEASES OF THE SECRETIONS.

CACHEXIÆ.

(1.) Rachitis, Rickets, English Disease, Double Limbs.—By rickets is understood a developmental disease of the skeleton, in which a diminution of the calcareous constituents of the bones is the principal symptom. The earliest definite descriptions of rickets date from the middle of the seventeenth century, and were given by the English physicians *Whistler*, *Boot*, and *Glisson*. About this time reports of a new disease were heard from various parts of England, and a commission, consisting of the physicians just named, was appointed to investigate it thoroughly.

Since that time but little has been added to our knowledge of the pathology, or causes, or varieties, of rachitis, till some fifteen years ago *Elsässer* discovered the rachitis of the skull. The pathological anatomy has been considerably enriched and elucidated since then by the researches of *Kölliker*, *Virchow*, and *Hermann Meyer.*

Pathological Anatomy.—For the purpose of correctly comprehending the rachitic alterations, it is necessary briefly to recapitulate the physiological growth of the bone. Every tubular bone grows in length and thickness. It grows in length by new layers of cartilage-cells which constantly form between the epiphyseal cartilage and the bone, in which calcareous salts are then deposited. It grows in thickness by the addition of new layers of bony substances immediately beneath the periosteum, from the tissue by which the latter is cemented to the bone. As the growth in thickness is much more insignificant, and progresses slower than that in length, the disturbances of the physiological growth at the cartilaginous ends are also more striking and liable to occur.

While the bone is enlarging externally in every direction, by the addition of new elementary tissue, the medullary space within it also increases in circumference. Thus we have a constant new formation of bone externally, an absorption of bone internally. The femur of a child may with ease be put into the medullary canal of the same bone of an adult, so that, by the time the child has grown up, the original infantile bone has been completely reformed.

The physiological growth of a bone consists, then, in—

(1.) New structural cell-elements deposited on its upper surface.

(2.) Their prompt ossification; and in

(3.) Absorption taking place in the centre of the bone.

Rachitis consists in the suspension, or in the imperfect performance of the second function or process, while the first and third remain normal, by which various very striking and peculiar alterations in color, form, and consistence, become perceptible.

In regard to *color*, the rachitic bone is particularly distinguished by a dark-red color, which, on the skull, may even assume a bluish redness. The more livid the bone, the greater, as a rule, has been the duration and the degree of the rachitic disease. All the bones of the same skeleton are not always reddened in an equal degree, some are darker, others again are brighter in color, and from this alone it is readily seen that rachitis is no simple chemical process, but is due to a complicated anatomo-physiological condition.

No rachitic bone retains its normal *form*. All the sharp angles of the bone become rounded off, the tubular bones in all cases become shortened, they cease to grow in length, the epiphyses swell and become bulbous, a condition which is most plainly seen on the sternal ends of the ribs, which are curved in various directions. On the tubular bones, for example, on the ribs, simple curvings occur, but very frequently actual fractures, or, more correctly speaking, contortions of the bones occur, especially in those of the lower extremities. In advanced rachitis the external layers of the bones, as we will show more in detail in the delineation of osseous derangements, contain so little calcareous salts, that they cannot be completely broken.

The internal parts of the bone lying next to the medullary canal, formed before the appearance of the rickets, may, it is true, break, and do indeed very frequently break, owing to their attenuation, in consequence of the absorption that goes on within. The external portions of the bones, however, yield, and, though they bend, still do not break, and therefore no displacement of fractured ends can take place. The bones that are bent, after the manner of a quill or willow-twig, subsequently heal with a blunt angle. This bending of rachitic bones, and the subsequent angular deformity, may result from the action of the flexor muscles and from the superincumbent weight of the body.

The apex of the angle thus formed in the forearm looks outward and forward, that of the arm almost straight outward, that of the thigh forward and outward, and that of the tibia, which usually bends near the ankle-joint, straight forward.

When such an infraction is sawn through longitudinally, after complete recovery, compact substance will be found on the convex surface only, and on the concave a broad layer of spongy substance. The medullary canal is completely closed at the point of fracture, by thick bony extuberations, which subsequently become attenuated, though they never disappear entirely. We shall speak more minutely of the alterations of form of the individual parts of the skeleton when we come to treat of symptomatology.

The diminution of the *consistence* of rachitic bones is very remarkable. Incisions may be made several lines in *depth*, and, when the disease is much advanced, the bones may even be cut through entirely without any very great exertion, and without notching the knife. These are the coarser anatomo-pathological signs of a rachitic bone.

When the affected skeleton is subjected to a closer examination, the following alterations, more or less marked on all the bones, will be found: the periosteum is thicker than usual, of a milky opacity in many places, and of a rose-red color. On attempting to pull it off, small and sometimes large fragments of bone will remain adherent to it; the bone is always dark red, and has a particularly rough external surface. This state of the periosteum is most distinctly seen on the frontal bones in craniotabes. The skull, in this case, is sawn, or may even be cut through with the knife, with the greatest ease; and on its posterior parts it is impossible to use the saw, for the spots, that have become attenuated to the thickness of a card, will yield, become depressed, and irregularly torn by the saw. From the section through the frontal bones, small drops of bloody serum exude; from the section of the temporal and parietal bones there will be less, and from that of the occipital there will not be the least of such serum. The frontal bones are always slightly thickened, sometimes to twice their normal thickness, and the anterior portions of the parietal bones in contact with the coronal suture partake in this thickening; while the posterior portions, on the other hand, are quite as often attenuated as in the normal state. Toward the lambdoidal suture, both it and the occipital bone become membranous in spots, which are of a yellowish-red color. The other parts of the bone which are not entirely wasted become extremely thin, of a bright color, and totally devoid of diploë. By holding the cranium up toward the light, the extent as well as the degree of this rachitic thinning, the craniotabes, is clearly seen.

If the calvarium is examined on its inner surface, numerous depressions are found, entirely on the occipital portion, answering to the *impressiones digitatæ*, each one of which corresponds to a cerebral convolution, whose pressure produced the attenuation of the bone, an atrophy indeed of the osseous substance. Finally, the *dura mater* and *pericranium* are in contact with each other, by which, in the dried preparation, the osseous tunics simply appear to be pierced and the membranes left intact. In these membranes, which resemble the dried fontanel, some white opaque points are still occasionally to be seen, which, on close examination, prove to be masses of unabsorbed calcareous mater. *Elsässer*, in his treatise on "The Soft Occiput," delineates a calvarium with nearly thirty apertures. Such a specimen, however, must be looked upon as one of the most extreme instances. The pericranium is, where it is stretched over the apertures, as well as in their vicinity, opaque and hypertrophied (Pl. VI., Fig. 4).

The pathological history of the soft occiput is: (1), one of deficient deposit of the usual phosphates in the external osseous layers of the entire bony skull; and (2), of absorption of those portions of the bone which have been softened by the pressure of the weight of the brain.

On the epiphyses of the tubular bones, additional characteristic signs may be observed. When a longitudinal incision of the articular head of a long bone—the femur, for example—is made, a thicker layer of cartilage is seen than in the normal condition (Pl. VI., Figs. 1–3a), and the line between the bone and cartilage, instead of being straight, is very irregularly indented and undulating (Pl. VI., Figs. 1–3b). The apices of the undulations which jut out from the bone into the cartilage are intensely injected, and contrast strongly with the bluish cartilage. The microscopical and chemical examination of the broad, bluish transition-layers, between the bone and cartilage, proves conclusively that it is a bone which has been retarded in its ossification, in which no bone-corpuscles at all, and but few traces of calcareous deposits in particular, are found.

On the diaphysis of the tubular bones equally marked alterations take place. The periosteum is materially thickened, and cannot be pulled off smoothly from the bone. Some fragments of porous bone are always torn off with it, and adhere to its inner surface. Immediately beneath the periosteum, broad whitish or reddish layers are found, which present a fine porous, pumice-stone-like structure.

The trabeculæ of this mass, according to *Virchow*, stand like perpendicular radiæ upon the surfaces of the bone. Deeper still, these radiæ are seen to be interrupted, first by a white and dense line of cortical layer, which is parallel with the upper surface of the bone. Then follows a new stratum of the same material, of a reddish color, and with stronger radiæ, which are again intersected by a compact parallel layer. Thus these layers alternate with each other a variable number of times, but the radiæ of the spongious layers constantly grow thicker, the nearer they approach the medullary canal, and their interstices become larger and redder, while the parallel layers become denser and firmer.

The rachitic tubular bone is softest and most porous directly beneath the periosteum, and constantly grows firmer toward the centre. The hypertrophy of the periosteum, and the softened condition of the external layers, explain also the singular process of infractions, and the impossibility of detecting actual displacement of the fragments and crepitation. These are the most important statements concerning the pathological anatomy of these bones. They are exhaustively and thoroughly depicted by *Virchow* in his Archives, vol. v.

The chemical examination of rachitic bones has always shown a marked diminution of the phosphates and carbonates of lime; the calcareous salts, instead of constituting two-thirds, often only forming one-fifth of the dried bone. In the urine, on the contrary, the phosphates are found augmented from three to five fold.

This increase of the phosphates in the urine, and its diminution in the bones, are not to be regarded as a process in which the calcareous salts already deposited in the bones are redissolved, and then excreted by the kidneys. The salts once deposited in the bones remain in them; a small quantity only may, as a result of the absorption that occurs in the parts in the immediate vicinity of the medullary canal, again come into circulation. The new enlargements in the longitudinal and transverse diameter of the bones, however, do not receive any more calcareous salts, and the salts of lime introduced with nutriments find no consumption in the organism, but are immediately excreted by the urine.

Why the deposit of calcareous salts in the bones ceases is still enveloped in complete obscurity. It is certain, however, that it is not a simple chemical redissolving of the already-perfect bone by an acid, for otherwise its structures would, both on the periphery and in the centre, be alike deprived of calcareous salts, which is certainly far from being the case. The layers immediately adjacent to the medullary canals are much more compact and richer in salts than those of the periphery.

If the skeleton of a child who has recovered from rachitis be examined, the bones will still be found curved in various degrees, the skull large, its sinciput hypertrophied, and the individual bones are remarkably heavy. All the soft, spongy, bony masses that have formed during the rickets have become converted into dense, compact osseous structure, and this subsequent ossification exceeds in hardness even the normal bone, on account of which they have also been called sclerosis, and in extreme cases even eburneatio.

No constant alterations are found in the rest of the organs, but the lungs, in all cases of marked rickets of the thorax, exhibit acquired atelectasis, and severe bronchitis, already spoken of in detail in the chapter on pulmonary affections, page 298. The muscles are pale and flabby, and in various places, especially in the heart, reveal fatty degeneration. The liver often displays a decided augmentation of fat.

Symptoms.—Rachitis is a tolerably acute affection, and generally appears on the head first, and always before the close of the first year of life. Next in frequency it is seen in the ribs, noticeable several weeks after commencing rachitis of the skull, and, lastly, in the lower extremities, the pelvis, and spinal column.

Formerly an especial prodromatory stage was assumed, and to it disturbed digestion, acidity of the stomach, and defective condition of the excretions, with general *malaise*, were supposed to belong. On the other hand, however, it should be borne in mind that the commencing period of rickets was entirely unknown before the discovery of rachitis of the skull by *Elsässer* in 1843, and that most of the signs of the so-called prodromatory stadium are now seen to be prolonged far into the disease itself.

Rickets is a visible and comprehensible disease, and it is therefore necessary to investigate more minutely the alterations of the individual parts of the body which result from it during life.

A.—*RACHITIS OF THE SKULL.*

Rachitis of the skull, with its peculiar phenomenon—softening of the occiput—was discovered by *Elsässer*. It is worthy of remark that, previous to the publication of *Elsässer's* work, no physician had any idea of this extensive morbid condition of the occiput, though it is one easy of examination and of detection. *Neumann*, for example, says that the bones of the head never soften through rachitis; on the contrary, they often grow at the expense of the other parts of the body. *Miescher* says that all the bones soften except those of the head. Various other remote alterations are indeed likely to originate about it, such as increased growth above the usual dimensions. *Schnitzer* and *Wolff* say that the bones of the skull never soften; they even grow, apparently at the expense of all the other parts.

The following are some of the alterations which occur about the rachitic skull:

The anterior fontanel, which, in normal children, closes at the latest at the end of the second year, remains open three to four years, and may even remain cartilaginous up to the sixth year. The serrated suture, which otherwise we find closed by the end of the first year, is frequently still ununited in the third year. The coronal suture, instead of being united in four months, remains open at the end of two years, and the lambdoidal, instead of being closed at three, is still open at the end of fifteen months. *Rufz* has instituted accurate measurements of the skull, and found that the longitudinal and the transverse measurements exhibit but slight deviations from the normal; but the peculiar angular projection of the protuberances of the frontal and parietal bones robs the sinciput of its usual globular form, and gives it a quadrangular, clumsy shape (*tête carrée*).

After recovery from the disease, a depression usually forms along the course of the coronal suture, which gives to the sinciput, when seen from above, the form of a calabash, and is due to an hypertrophy of the frontal bones. Numerous depressions and elevations in general take place during rachitis, which opens a wide field of research for cranioscopy.

The soft occiput is met with in children from the third month on, but is seldom seen in those who have passed the second year. No constant prodromata are observed. Many children may have, indeed, been previously subject to a bronchial or intestinal catarrh; others, however, have enjoyed the best of health, and, up to the appearance of the craniotabes, were well nourished, fresh, and hale.

The disease begins with profuse cephalic perspiration, which often soaks through the pillow, and a nocturnal restlessness, increasing gradatim, becomes noticeable at the same time. Children, who otherwise slept uninterruptedly for several hours, wake up every quarter of an hour crying, and rub and bore the head into the pillow. Changing the posture of the head quickly tranquillizes them, but only for a short time. The incessant rubbing of the head on the pillow produces a complete alopecia of the entire occiput.

After some time the whining and discontentedness grow worse, extending even to the daytime, and attentive nursery-maids soon notice that the discomfort is subject to the varying positions of the head. The patients cry, and constantly bore the head when they are kept horizontally, or on the arms while being fed, or put to sleep, but soon become quiet when they are raised up and the occiput is relieved from all pressure. They then take their food with the greatest comfort, and prefer also to lie with the face resting upon the nurse's shoulder, and the occiput entirely free. Older children occasionally quickly turn over in bed on the belly, and lie with the forehead pressed into the pillow.

The feeble growth of the hair in general, and the alopecia of the occiput, are very noticeable, and, on closely inspecting the skull, the occiput is generally found flattened and the protuberances more angular than usual. For the purpose of a more accurate manual examination, the occiput should be taken upon both hands and felt of with the ends of the fingers.

I examine the whole posterior region of the head, from the lambdoidal angle to the mastoid process, *twice* carefully by the ends of the fingers. The first time, for the sake of precaution, I exercise only a very mild pressure with the flat, open fingers, so that, in case large, very soft places exist, no great violence may be done to the unprotected brain. The second time, I bend the fingers at the point a little, and press forcibly upon every part of the occiput and parietal bones. By this procedure even the mintuest point of attenuation marked by depressibility may be discovered with certainty.

The soft places generally vary in size from that of a lentil up to that of a bean, and are found in the vicinity of the lambdoidal and posterior portion of the sagittal sutures, and sometimes encroach upon the sutures. The external occipital protuberance only is always spared. The diseased parts of the bones are elastic, their original convexities may be converted into equally as great concavities, and, when pressed, yield like a card when laid across a hollow, or like an inflated dried bladder. The pain attending a careful examination is not very great.

The most frequent complications of this affection are spasms of the varying groups of muscles. The most dangerous of these is spasm of the glottis, whose undoubted yet by no means physiologically explained connection with craniotabes has already been discussed in detail on page 274.

Besides attacking the occiput and the sinciput, rachitis invades the jaws. The teeth cease to grow, so that the patients get to be twelve and eighteen months old before they cut the first incisor teeth. After these have finally appeared, they turn black, and, for want of enamel, crumble down. When the enamel is totally wanting, the whole tooth down to the margin of the gum will disappear; sometimes it is only deficient on the apex, and the blackness is then restricted to that point. As the disease disappears before the second dentition commences, these phenomena are not observed in the permanent teeth.

Deficiency of the enamel, now and then met with in older children, is, according to the statements of some authors, due to the use of mercurial preparations, especially calomel. Should it actually be statistically demonstrated that the majority of these children had taken calomel, it would, very properly, in future, much restrict the use of this medicine.

B.—*RACHITIS OF THE THORAX.*

Glisson and his contemporaries correctly recognized the rachitic process, in the condition known as pigeon-breast, and subsequent authors devoted much of their time and attention in investigating the manner of its origin; we therefore have much more explicit data concerning rachitis of the thorax than of craniotabes.

It usually comes on somewhat later than softening of the occiput, and many children who fortunately escaped the latter, and are already being carried about upright, are attacked by rachitis of the thorax. Perceptible alterations are seldom observed in children under six months, while craniotabes may be present as early as the third month of life. The statement made in some of the text-books, that the pigeon-breast occurs from the first to the fourth year of life, is to be understood as meaning that children so old as four years may be observed with this disease. But, after the completion of the first dentition, rachitis never comes on in a child hitherto perfectly healthy.

The first symptom of rachitis of the ribs is a marked pain on touching or pressure of the thoracic walls. Nurses say that "the child cries every time we raise it up, if ever so tenderly." Usually such statements are not much heeded by the physician, because most of them are based upon prejudice and incorrect views. The frequency of these complaints, however, struck me long ago, and I have convinced myself that it is by no means a rare occurrence that children between five and ten months old suddenly cry out in pain when they are grasped with both hands under the axillæ and lifted up, and, as soon as they are laid down, become tranquil again. Nay, more, it is not even necessary to lift them up; slight pressure with the finger in the axillæ or on the thoracic walls generally, suffices to produce pain. If such a child is tenderly raised with one hand under the pelvis, and the other supporting the neck, it will remain as quiet as if it had been lying on the pillow, and in this manner, also, its bedding may be changed without giving it any pain.

At this time, little or no hypertrophy can be felt at the sternal end of the ribs, the boundary between the costal cartilages and the bone. The sternal ends of the ribs do not begin to appear bulbous and hypertrophied, so as to be detected by the finger, and later also by the eye, till after several weeks. Thus two uniform rows of buttons, the so-called rachitic wreath, appear on both sides of the thorax at a point corresponding to the end of the costal cartilages. These buttons, so palpable from without, project still more internally, forming large angular tubercles which encroach upon the cavity of the thorax.

The thorax always becomes deformed in those cases where these hypertrophies have existed for some time. The sternum, which likewise undergoes softening, is pushed off more and more from the spinal column, and arches outwardly; the xiphoid cartilage becomes extremely movable, and, projecting, forms a deep pit in the scrobiculo cordis. In the severest grades of pigeon-breast, the costal cartilages immediately behind the sternum run straight backward to meet the elongated transverse processes of the spinal column, and thus, at their anterior ends, the ribs form a concavity instead of a convexity.

The diameters of the thorax become smaller from side to side, and larger antero-posteriorly, as is shown by the delineation, Pl. V., Fig. 2. The transverse diameter of the thorax assumes the shape of a pear, whose apex is supposed to be at the sternum. The rachitic wreath is found chiefly from the second to the eighth rib, the false ribs are forcibly pressed outward by the liver on the right, and by the stomach and spleen on the left side. The abdomen, in consequence of the constant tympanitis, and a shortening and curving of the spinal column, is tumefied, and of globular form, and much encroached upon by the distorted thorax. The spinal column is curved most during the sitting posture, and the globular shape of the abdomen is also on that account most striking in this position. When these children are laid upon the belly, and in this position raised up, the external curvature of the spinal column disappears entirely, and assumes again its normal form. In neglected cases, and where the rachitis has existed for several years, a permanent arching—not an angular curving—of the dorsal vertebræ, laterally and posteriorly, may take place.

The origin of the pigeon-breast is explained, in part, by pressure of the atmosphere upon the soft ribs, and, in part, by the traction of the diaphragm, for which they serve as points of attachment. Having lost their firmness, the ribs are no longer able to withstand the constant dragging inwardly by the diaphragm.

From rachitis of the thorax there originate (1), *an alteration in the curve of the ribs;* and (2), *an arrest in the longitudinal growth of the ribs*, a still more serious result, which inevitably diminishes *the pectoral space*, and promotes that disease of the lungs known as acquired atelectasis, as has been already conclusively shown on page 299.

The prognosis depends exclusively upon the affection of the lungs. When a great portion of them is involved in the atelectic process, and has become impermeable, then, of course, a serious catarrh in the remaining normal tissue suffices to induce labored breathing, and even dyspnœa, suffocating attacks, and death. In this complication, in fact, we have the usual cause of death in rachitic children, as *Romberg*, *Guersant*, and others, have remarked.

C.—*RACHITIS OF THE PELVIS AND OF THE EXTREMITIES.*

The pelvis does not become deformed before the rachitic child is able to walk, and then it is the result of scoliosis, or of an inequality of the lower extremities, after the manner of a distortion of the pelvis in coxarthrocace. The important consequences of this alteration in the female are discussed sufficiently in detail in the standard works on obstetrics.

Rachitis of the *extremities* is first recognized by a bulbous enlargement of the epiphyses of the radius and ulna at the wrist-joint. Its appearance at these points is at a somewhat later date than at the ribs, usually during the last months of the first year of life. The degree of the rachitic affection is always most distinctly recognized at the wrist-joint, because here the epiphyses, in the normal condition, are distinctly seen, and, on account of being superficially situated, are easily examined.

In the cadaver, the lower extremities are found as severely affected with rickets as the upper; but, since important hypertrophies about the knee and ankle-joints occur even in healthy children, rachitis produces in them no such striking alterations of form as are seen in the wrist-joints. Of course, if the disease has reached the stage of deformity, the rachitis of the lower extremities will also be recognized in the gait, and it will not be necessary to even undress the child to see it. The protuberances on the ends of rachitic long bones in reality represent their longitudinal growth. New cartilage is constantly formed on the epiphysis; but no ossification of the newly-deposited mass takes place, and thus the soft cartilage is pressed out by the contiguous bone, and by the traction of the muscles into unnatural breadth. Hence the bulbous enlargement constantly increases, for new cartilage is continually deposited.

A comparatively diminutive state of all the cylindrical bones results from this cessation of the longitudinal growth, and is most evident perhaps in the ribs, and resulting, as has been stated, in the production of the acquired atelectasis. The shortening of the lower extremities is still noticeable years after recovery from the rickets, and such children are always smaller in stature than their healthy companions of the same age.

The simple curvatures straighten again in the course of years; the pigeon-breast may dilate again completely, and the crooked sternum may become straight. The infractions, however, leave behind them alterations of form which are permanent.

As regards the functions of the rachitic lower extremities, they are very much retarded. Such children do not learn to stand till the second or third year, and to walk still later. Occasionally it happens that children, who were able to stand before they were attacked by rickets, do not recover this ability until many months later.

Few diseases interfere with a child's use of its limbs for so long a time as rickets. Children may have been ever so sickly, in the first year of life, from almost any other disease, but, so soon as they rally, if they do not become rachitic, commence to acquire the use of their limbs, and at eighteen months, at the latest, begin to stand.

I was once able to observe accurately the origin of the infractions. A child, four months old, was attacked by convulsions. I carefully examined its body, and found all the tubular bones straight; still a rachitic wreath and hypertrophied epiphyses at the wrist-joints were perceptible. During the night the convulsions grew worse, and on the following morning one forearm and one tibia, both at the lower third, were bent at an obtuse angle, and the parts around were somewhat swollen and excessively painful. The fractured ends, of course, did not crepitate, nevertheless they were movable to a high degree. The denomination "fractured ends," strictly speaking, is not applicable to this condition, for no complete solution of continuity, but only a simple bending of the bones, occurs.

Besides these especially characteristic signs of alteration of the bones, others no less constant also occur in other organs. With the appearance of the rickets, or some time before, excessive cephalic, and afterward general perspirations, invariably come on, as a result of which numerous affections of the skin become developed. Actual sudamina, or, still oftener, the so-called sudamina rubra, very small, opaque vesicles with red areolæ, appear, and are so close to each other that often the entire body and the flexures of the extremities appear reddened, rough, and uneven. Later, when the patients begin to grow lean, the skin fades in color, becomes covered with a furfuraceous, squamous exanthema, and the secretion of the perspiration ceases almost completely.

The ligamentous apparatus, especially the capsule of the hip-joint, is extremely feeble and relaxed, so that children are able to touch their faces with the feet, and have an especial predilection for putting their toes into the mouth.

As relates to the respiratory organs, spasm of the glottis, mention of which has already been made, when speaking of craniotabes, very frequently occurs, and, in addition, constant bronchitis, which, on account of the increasing carnification of some parts of the lungs, becomes severely aggravated.

The digestion may, indeed, remain undisturbed during the entire disease, but, when diarrhœa supervenes, the disease, going on in the bones as well as in the system generally, becomes materially aggravated. It is a remarkable phenomenon that even young children, laboring under an intense form of rachitis and loss of appetite, tolerate cod-liver oil, and during its use get a better appetite and digestion.

A few words more concerning the connection of the disease under consideration with *tuberculosis* and *scrofula*. Rickets was formerly called "scrofula of the bones," and it was regarded as one of the many localizations of the scrofulous cachexia. *Rufz* was the first to prove, by the histories and autopsies of twenty rachitic patients, that the majority of them were not in the least scrofulous, and, since that time, we learn more and more to regard rickets as a sui-generis disease.

Rickets, according to my extensive observation on many hundreds of cases, is an independent affection, which, under certain conditions, and at a certain age, may almost voluntarily be induced in every child —more in one, less in another. Scrofulous children do not acquire it oftener than healthy ones: so the fact, as it occurs here in Munich, that rachitis and scrofula but rarely occur together in the same person, must be accepted as proof that in this country the majority of rachitic children are not scrofulous.

Etiology.—Remarkably few positive data are known concerning the causes of rachitis. In a great number of cases, the possibility of its being inheritable is not to be ignored. I know several families the children of which, notwithstanding all possible care, and the most rational prophylaxis, always become rachitic at a certain age, and suffer from it for years. In these cases, the father and mother usually display the peculiarly-shaped rachitic head, with its boldly-projecting tuberosities of the frontal and parietal bones. *Elsässer* and others also furnish us many positive instances on this point. The previous existence of syphilis, on the part of the father, has often been confessed to me, though cured. Rachitis in children of wealthy families may probably be explained in this manner.

In other instances it is developed with remarkable rapidity after acute diseases, such as measles, pneumonia, intestinal catarrh, etc.

Of external causes, there is only one that can be maintained with certainty, namely, the *want of fresh air*, and this is unanimously stated by observers as the most frequent cause. This also explains the reason why rachitis occurs most frequently, and is most intensely developed, in the spring of the year, less so in the fall.

Long confinement in closed and badly-ventilated rooms during the winter has caused it. Enjoyment of fresh air in the open street or public place in the summer cured it. Rachitis, for the same reason, is less frequently met with in southern climates.

Prognosis.—As a simple alteration of the bones, rickets is never dangerous, and, in many instances, is arrested, and a final recovery takes place, after the conclusion of the first dentition. Its complications, however, are extremely pernicious, and by these the greater portion of the rachitic children are carried off.

Spasm of the glottis is apt to supervene at the very commencement of rachitis, when the soft occiput is as yet barely noticeable, and destroys the majority of children it attacks. It will be entirely impossible to prevent the degeneration of some pulmonary lobules, if the rachitis of the thorax makes much progress, for the lungs constantly increase in bulk, while the chest does not expand in proportion; on the contrary, it even becomes smaller by the projection of the sternal ends of the ribs inwardly. When this degeneration, or carnification, or acquired atelectasis, involves a large extent of lung-tissue, severe dyspnœa and a mild catarrhal affection of the remaining normal tissue ensue, which almost invariably lead to death.

Lastly, the curvatures and hypertrophies of the long bones may result in permanent deformities, shortening of one or the other extremities, contraction of the pelvis, and displacement and serious disturbances of the functions.

Treatment.—A countless number of remedies were employed in this disease before the introduction of cod-liver oil, and cort. aurant., rad. gentian rub., herb. absinth., rasura lig. quassiæ, calam. aromat., cinchona, colombo, and the preparations of iron, were the ones most highly recommended. Externally, baths, affusions, and fumigations, with all possible aromatic herbs and their preparations, were employed. Later, dyers' red (madder) came into use, principally recommended by *Feiler* and *Wendt.* Part of this red substance, as is known, becomes deposited in the bones, and it cannot be denied that it possesses a direct influence upon them; but the alteration of color effects no increase in the calcareous deposits.

Meisner believed he had observed that vaccination arrested the progress of rickets, but *Rufz* emphatically, and with justice, denies it. *De la Fontaine* entertained the same views with regard to scabies!

The idea occurred to some that there was a real deficiency of bony substance, and they attempted to introduce it through the alimentary canal. *Wurzer* experimented in this direction with phosphoric acid which proved perfectly fruitless, and lately *Beneke* proclaimed *phosphate of lime* as an antirachitic. The reports of the experiments, wherever instituted with it, are not by any means favorable, and it is now very generally abandoned.

Finally, in the year 1824, *Schütze*, *Schenk*, and *Tourtual*, in Germany, called the attention of the profession to cod-liver oil, while the French physicians became acquainted with it five years afterward through *Brétonneau*, who was informed of it by a lay person from Holland. Since that time the favorable reports of ol. jecor. asell. have accumulated in such a manner that all the remedies heretofore used in this disease have been supplanted by it.

A great deal has been disputed concerning the active principle of the cod-liver oil. Some believe that it simply acts as a respiratory remedy through the fat it contains; others seek its effectiveness in the traces of iodine and bromine, and still others in its oleic acids, and the admixture of decomposing particles of liver which are found in all cod-liver oils.

Since the experiments with pure fat, as well as those with minute doses of iodine or bromine, did not produce the desired effect, the last view seems therefore to be nearer the true one.

It is best to give the brown oil pure by itself in increasing doses, at first a teaspoonful, later a tablespoonful once or twice daily. Most of the children habituate themselves so well to it in a few days that they come to look upon it as a delicacy, and will drink several ounces of it at a draught, if they manage to get hold of the bottle. *Rachitis may be cured by the use of cod-liver oil alone*, even if the circumstances are in other respects *unfavorable.* To be sure, any possible improvement in the residence and nutrition will hasten the recovery. In this respect the following measures should be attended to:

Pure, fresh air is, above all things, necessary. In damp houses, which in winter are not ventilated for many weeks, children acquire rachitis very quickly, and in an intense form, and in these individuals cod-liver oil has only a slow and not a constant effect.

Zealous attention to the skin is to be mentioned as a second important adjuvant. The child should be bathed daily in an aromatic bath, and, in addition, the curved limbs should be washed every day with brandy.

Most of the young children, even with craniotabes, tolerate cod-liver oil very well; their restlessness is best palliated by douching the head with cold water, repeated every two or three hours. *Elsässer* recommends a pillow for the head, in which a pyriform hole is constructed, with the apex directed downward. It is a great comfort to the little patient. On account of the profuse perspirations, rachitic children should not be laid upon feather beds, but always on mattresses of horse-hair, straw, or sea-weeds.

Children who are still at the breast should be wet-nursed as long as possible, but, in addition to that, should be fed with broths. Cow's milk is the best nutriment for children up to the third year, and cannot be substituted by any other; it is to be given as plentifully as possible.

During the disease, an orthopedic treatment will hardly ever be of any benefit; not till after it has been cured can the proper machines and appliances be resorted to.

Great rachitic deformities, even in the adult, may sometimes be remedied by exsecting an accurately-calculated wedge of bone, and applying a proper apparatus.

(2.) TUBERCULOSIS AND SCROFULOSIS.—A great deal has been disputed concerning the distinction between tuberculosis and scrofula. Some consider these two conditions as perfectly identical; others, again, assert that there is no resemblance whatever between them.

It all depends upon the point of view from which the comparison is instituted. If regarded from the anatomo-pathological point of view, it may be affirmed with certainty that coxarthrocace and scrofulous inflammations of the joints, spondilitis, the affections of the cornea and conjunctiva, otorrhœa, and scrofulous diseases of the skin, *are not usually due to tuberculosis of the affected parts.* But, in practice, the physician is continually witnessing the fact that the two diseases just mentioned are (1), by no means local troubles, but partly alternate with each other, partly occur simultaneously on different parts of the body; (2), that such children are *always* the progeny of tuberculous parents; and (3), that, after the disappearance of the scrofulous affections, which usually occurs about the commencement of puberty, these persons always become more or less intensely tuberculous.

In practice, then, the physician cannot do otherwise; he must assume the existence of an intimate connection between the two cachexiæ. But the pathological anatomist, who devotes his attention more to the morbid products than to their origin, may very well consider the produced alterations separately. Still, even pathological anatomy shows, in very many instances, the material connection between the two. In almost all infantile cadavers, which reveal any scrofulous lesions, or affections of the bones or lymphatics, there will also be found within, generally in the bronchial glands, one or more large, yellow, cheesy tubercles, which are to be looked upon as the root, as the starting-point, of the numerous peripheral scrofulous affections.

Having thus established the connection between the two cachexiæ, we may now pass on to their separate consideration: (A), tuberculosis, and (B), scrofulosis.

A.—*THE TUBERCULOUS CACHEXIA.*

Since, in the entire plan of this work, the diseases have been treated of according to the individual organs, and not according to the nature of the pathological alterations, tuberculosis has therefore already been frequently discussed; and, in order to avoid repetitions, we refer the student to the former sections. Tuberculosis of the lungs will be found described on page 309, that of the bronchial glands on page 311; of the brain, on page 339; of the ear, page 433;

of the mesenteric, on page 157; of the kidneys, on page 444; tuberculous peritonitis, on page 219. It remains only to speak of the general symptoms of tuberculosis and of its etiology. The treatment, finally, may be comprised with that of scrofula. But it is also presupposed that a knowledge of the general views of tubercles, their origin and retrograde formations, has already been acquired by the student.

GENERAL SYMPTOMS OF TUBERCULOSIS.—When single organs are particularly severely attacked by tuberculosis, the functional disturbances of that organ will naturally become very apparent, and will eclipse the symptoms peculiar to the cachexia, as is particularly observed in tuberculosis of the lungs, of the brain, and of the peritonæum. Very generally, however, when the intensity is less boldly stamped on a single affected organ, the following tolerably constant general symptoms make their appearance:

The *color of the face*, in general, is pale, sallow, and anæmic; the cheeks frequently display a unilateral circumscribed redness, which disappears after a few hours. Severe disturbances of the circulation in the lungs, or very voluminous bronchial glands, may also induce serious dyspnœa, followed by death. Most of the tuberculous children bear a painfully-sad expression in their countenances; the lethargic movements of the eyelids and of the globe, the sclerotica of which becomes markedly bluish, give them an extremely peculiar appearance.

The *fever*, consisting in an increased temperature of the skin and accelerated pulse, is a constant symptom in general tuberculosis. But a distinction should be made between the usual frequently exacerbating vascular excitement of chronic tuberculosis and hectic fever, which comes on in the last stage, and continues until death ensues. All tuberculous children frequently, especially toward evening, have a hot, dry forehead and hands, increased thirst, and a general heightened temperature of the skin; but all of these symptoms disappear after a few hours, and often do not recur for weeks. The nutrition of the children does not materially suffer from these transient vascular excitements, and the latter may also disappear entirely if no new tuberculous injuries ensue.

The case is entirely different with *hectic fever*. The pulse, which at first is hard, later on small and compressible, rises to 150 beats and more per minute. Every evening an exacerbation ensues, but no complete feverless condition ever takes place again. This fever may last for months, and even years; in the latter case, naturally, it is less intense, but it induces an emaciation down to a mere skeleton, and does not forsake the child until death. Toward the end, the temperature of the skin, according to the feel, does not rise in exact relation to the acceleration of the pulse; on the extremities it is more apt to sink to below the normal state.

At the commencement of tuberculosis, or when the sick child is not watched long enough by us, this fever is apt to mislead our diagnosis. The vespertine exacerbations may simulate an intermittent, but this error soon becomes manifest from the failure attending upon the use of large doses of quinine. Occasionally, the diagnosis vacillates, for several weeks, between acute tuberculosis and typhus fever, and this is all the more likely to happen in children, as infantile typhus has fewer well-pronounced symptoms than typhus fever in the adult. Even when the tuberculous pulmonary symptoms are somewhat more predominating, it is often a question whether the continuous fever may not be prolonged by a pneumonia that runs an irregular course.

The nutrition suffers markedly in all tuberculous children, and an alarming emaciation soon ensues, which, however, as a diagnostic sign, is of no great importance, as it is also produced by all febrile, protracted infantile diseases. Acute tuberculosis of children under one year is an exception in this regard. These children retain their plumpness almost until death, especially if they nurse at the breast of their mother; but the constant hot skin, and the incessant cough, with which a great deal of white froth is expelled from the mouth, permit one to form a diagnosis of acute tuberculosis with the utmost probability, and the autopsy, in most instances, confirms this approximative diagnosis.

When thrush forms upon the mucous membrane of the mouth, in older tuberculous children, a speedy lethal end may be predicted, almost with certainty. The tongue presents but little that is characteristic. The appetite is frequently still fair, even when hectic fever has already set in; on the whole, it is not noticeable that these children become less emaciated, and live longer, than others which suffer from continuous dyspepsia. Diarrhœas are frequently observed, but not always due to ulceration of the intestines; in most instances they are the effects of simple catarrh of the intestinal mucous membrane.

The *skin*, in chronic tuberculosis, is never normal; it loses its original smoothness, and becomes flabby and corrugated in consequence of the diminution of the subcutaneous adipose tissue. A furfuraceous desquamation frequently takes place upon the trunk and neck, which disappears for some time, but soon returns again, and becomes complicated with pityriasis versicolor. The strongly-desquamating, denuded spots perspire but little; the others, however, as an offset, all the more profusely. The perspiration, especially about the head, is seen to gather in large drops, wetting the hairs and pillow. Conformably therewith, sudamina are often observed in large numbers.

General œdema does not occur in simple tuberculosis; in the last stage, however, a slight œdema, about the ankles and dorsum of the feet, takes place. In infants, this œdema is a safe cardinal point, for it is almost exclusively seen in tuberculosis, and the physical examination of the chest usually furnishes no satisfactory signs. Occasionally, a partial œdema of the face, and of the upper extremities, originates, and is due to local derangements of the circulation. Greatly enlarged bronchial glands have been observed to exercise pressure upon the vena cava descendens, and thus cause stagnation in its vascular sphere.

Chronic tuberculosis either retains its character till death, and the patients die from the effects of the fever, of the emaciation, and of the exhaustion, or the lethal end is accelerated by miliary tuberculosis and acute hydrocephalus.

The *prognosis* need not be put down as absolutely fatal, even in tolerably advanced tuberculosis, for cases occur in which, notwithstanding all the bad signs, an arrest nevertheless ensues, and, after many years of sickness, perfect nutrition and progressive development finally take place again.

Etiology.—There is no disease that is so positively inheritable as tuberculosis, and this inheritability is so clearly demonstrable, in many cases, that I suspect it is the only and true cause of the cachexia. True, children bring no ready tubercles with them into the world, and, so far as I am aware, none are ever found at autopsies of the new-born, but tuberculosis may completely develop itself as early as the first few weeks of life; so that miliary, and occasionally large tubercles are found in an infant that only lived two or three months.

The intensity varies very much in degree, according to the kind of constitutions the parents have. If only one of the parents is tuberculous, and the other comes from a perfectly healthy family, then all the progeny of this alliance need not necessarily be tuberculous, nor even scrofulous. It fares just the same way with the inheritability of tuberculosis as with the formation of the body. When the father has black hair and brown iris, the mother blond hair and blue iris, then the children usually have *no* mixture of these variegations of color; but, in most instances, a portion of them will take entirely after the father, another after the mother. Now, when the father is tuberculous, but the mother healthy, or *vice versa*, it may very well happen that a part of the children will be perfectly sound, another decidedly tuberculous. Frequently, however, a weakening of the cachexia, which manifests itself by milder scrofulous forms, is observed on the one hand, and, on the other, slight scrofulous affections and a disposition to bronchitis, chronic blepharitis, and phlyctenular conjunctivitis, in apparently perfectly healthy children.

Now, by "crossings" between strongly tuberculous, feebly tuberculous, and healthy persons, a number of gradations originate; and in the limitless extent to which the cachexia has now attained, but very few families will be found to have remained perfectly free from all dispositions to tuberculosis, and from all the scrofulous symptoms which point to it. The chief difficulty that has to be overcome, when the attempt is made to explain the origin of tuberculosis by the inheritability alone, is this, that especially the milder grades of tuberculosis, some circumscribed, perhaps even cretaceous tubercles, are not diagnosticable. Very frequently, in fact, the residue of a former tuberculous process, of which no one had the least idea, is found in the apices of the lungs or bronchial glands, at the autopsies of the strongest, best-developed individuals who succumbed to some acute disease. Consequently, it is never possible to maintain, with any degree of certainty, that there is no hereditary disposition, and that the tuberculosis, in a given case, has to be produced entirely by external causes.

The following are generally considered the external causations of tuberculosis: bad air, confinement in close, imperfectly-ventilated, dusty rooms, damp houses, and bad food, by which, living exclusively on rye bread and potatoes, and the deprivation of animal food, is unstood. But if any deductions regarding these external causes can be drawn from a large poor practice, such as mine has been for the last few years, then it becomes pretty evident that tuberculosis is very rarely generated by them; and, on the other hand, it is very often found where these external causes are entirely absent.

The circumstances are most strikingly manifest when children of different parents grow up in one family, a very frequent occurrence in the case of illegitimate children who cannot remain with their mothers, but have to be boarded in another family. Now, when the family that have taken charge of this child have children of their own, all the children will live together under the same circumstances. They sleep in the same rooms, they eat from the same dish, they are alike neglected as regards attention to the skin, and yet it is observed scores of times that the strange child remains perfectly well, while their own children are the whole year through under treatment for scrofulous affections, or that the contrary happens to be the case. Now, when these facts recur so often that every busy physician is able to count them in large numbers, the faith in external causes, unwholesome food, bad air, inattention to the skin, becomes more than vacillating, since, among the great masses of proletarians who live crowded together in large cities, tuberculosis would have to be still more frequent than is actually the case. Entire houses, and even streets, in which these poor people are huddled together, ought to be tuberculous, a circumstance which, so far as I am aware, has never been observed in any city.

These external causes may be of the utmost importance for children who bear the germ of tuberculosis, and increase and aggravate the kind as well as the number of the single exacerbations; where, however, the former does not exist, the children certainly develop slower, remain pale, lean, and small, yet do not exhibit tuberculosis, nor even scrofulosis.

Let us consider the affair from the opposite direction. In children of the opulent classes these external causes are entirely absent, and thus fewer children of the affluent ought to be tuberculous than of the poor who may have become so through the unfavorable circumstances under which they are situated. But, so far as the general survey reaches (these circumstances cannot be calculated by per cents.), it is found that children of the rich are not less frequently tuberculous than those of the poor, nay, more, the disease seems to occur oftener and more predominantly in the former class. This view also results in the fact, that by far less weight ought to be placed upon bad diet, residence, and inattention to the skin, than upon the hereditary disposition.

Although the external causes are of but slight importance in regard to generating tuberculosis in healthy individuals, it must nevertheless be acknowledged that they become powerful agents where the hereditary disposition exists. In this respect, however, other preceding diseases are of more importance, especially measles, syphilis, whooping-cough, and typhus fever. After these maladies, tuberculosis suddenly develops itself in children who formerly were apparently perfectly well. It most frequently comes on after measles; here it is such a frequent follower, that the assumption, that no child with an hereditary disposition is attacked by measles who does not subsequently become tuberculous or at least scrofulous, seems justifiable. This tuberculosis following upon measles distinguishes itself, from that of the spontaneously originated, by the fact that an arrest, and finally even a decided improvement, is much more frequently observed in it than in the latter kind.

B.—*THE SCROFULOUS CACHEXIA.*

By scrofulosis we understand a series of inflammatory processes upon the *skin* and *mucous membranes*, on the *organs of sense*, *sight*, and *hearing*, in the *lymphatic glands*, and on the *bones* and *joints*, which, anatomo-pathologically, *have no connection whatever.* They differ materially in their course from simple traumatic inflammations of these parts, and seldom occur singly, but in most instances on several parts of the body at the same time.

Examination of the affected parts alone, even without taking into consideration the entire state of the organism, often furnishes such peculiarities that the adjective "scrofulosus" may be added to the name of the inflammatory process with the utmost surety. This remark is especially applicable to some of the diseases of the eye, to the ulcerating lymphatic glands, and the affections of the bones and joints, while most of the cutaneous eruptions, catarrhs of the mucous membranes, and otorrhœa, can only be recognized as being cachectic by the obstinacy of their course and complication with markedly scrofulous affections of other organs.

The opponents of the scrofulous diathesis theory, who obstinately shut their eyes against the manifest common and intimate connection between the affections just mentioned, fall back upon this argument in particular, that the *cachexia has not been shown to be present in the blood.* Singularly enough, they forget that, in none of the dyscrasiæ in general, neither in syphilis, nor in carcinoma, nor in tuberculosis, has it been possible to detect any thing specific in the blood; but that general diseases are here in question has been emphatically acknowledged by all thoughtful physicians.

The following principles must be maintained from a clinical point of view:

(1.) There are certain chronic inflammations which have an intimate etiological connection.

(2.) Children affected by them are, in greater part, the progeny of tuberculous parents; and

(3.) These children very frequently become tuberculous after the appearance of puberty, even when the scrofulous phenomena have disappeared long before.

Scrofula therefore seems to be the commencement—perhaps, also, an imperfect development of tuberculosis. According to my observations, which, unfortunately, on account of the difficulties attending upon the demonstration of tuberculosis in the parents, have never led to precise results, it occurs principally in families where one of the parents is healthy, but the other tuberculous. Where both father and mother are tuberculous, most of the children perish in the first few years of life, from true tuberculosis, and overleap these milder transitions altogether.

As regards the general symptoms of the so-called scrofulous diathesis, most of the signs classified under it are merely the simple effects of the local processes, and do not depend upon any particular inherited anomalies of the constitution. This is also the reason why the delineation of the so-called scrofulous *habitus* cannot be comprised in one picture, but must be given in two forms, the erethitic and the torpid.

On close examination it is seen that the description of these two forms is reduced to extremely vague statements. Thus erethitic scrofulous children are said to have a slender frame of body, feeble muscular system, keen comprehensive abilities, delicate formation of countenance, fine eyes, bluish sclerotica, and dilated pupils. The torpid scrofulous diathesis, on the other hand, is said to be recognized by coarse features, large head, wide jaws, bloated nose and upper lip, reddened eyes, swollen lymphatic glands, and large abdomen.

In this delineation general constitutional derangements have been improperly thrown together with local morbid processes. The general characters are extremely unreliable, and in addition entirely incorrect; the local, the bloated nose and upper lip, reddened eyelids, glandular hypertrophies and tympanitic distended abdomen, are indeed local phenomena of scrofula, but they are not so constant as to be capable of producing the diathesis, and their absence or disappearance is by no means proof positive that the children are *no* longer scrofulous.

Children may, indeed, entirely get rid of their scrofulous habitus, of their adenitis meibomiana, of their tumefied nose and upper lip, which, in fact, are only caused by chronic catarrh of the nasal mucous membrane and its corroding secretion, and, after several months, again acquire the same or other scrofulous affections. So, then, the habitus will be present, or not, according as to whether these local inflammations happen to be present or have disappeared.

Now, so far as relates to the local processes, they are collectively distinguished by a tedious course, frequent relapses, and obstinate resistance toward all local treatment by cauterizations, cataplasms, and ointments of all kinds. The majority of them present such characteristic symptoms that they merit a separate consideration.

(a.) *Skin.*—Here the discharging eruptions, eczema, impetigo, and ecthyma, most frequently occur.

Furunculosis, which likewise attacks only children of tuberculous parents, has already been spoken of on page 512.

By eczema an inflammation of the skin is understood, in which a fluid exudation accumulates beneath the epidermis, and assumes the form of small, closely-aggregated vesicles spread over a large surface. An eczema simplex and rubrum are distinguished according as the adjoining portions of the skin are strongly or slightly erythematous and tumefied. The name of eczema impetiginodes has been bestowed upon a variety in which the vesicles are larger and filled with pus. No particular forms, of course, can be assumed, for all the three forms, or, at least, one after the other, may very readily occur in one person.

Symptoms.—In all cases, when the vesicles and pustules burst and dry up, yellow scabs form, which are elevated by the succeeding exudations, and the previous desiccating processes begin anew in the same manner. The crusts on the scalp become much thicker, by agglutination with the hairs, than on other parts of the body. The secretion occasionally becomes so profuse that large drops of turbid serum ooze out from some of the existing cracks and fissures of the crusts, and may even flow down. This exudation also corrodes remote parts of the sound skin, and upon these a similar suppurating eruption may originate.

Eczema has no special connection either with the glandular or with the follicular apparatus, but is a pure inflammation of the cutis; it is most frequently met with in scrofulous children upon the head and face (tinea capitis, porrigo), but, after all, does not wholly spare any part of the skin. After from four to eight weeks, a spontaneous recovery usually ensues; generally, no one place suppurates longer than half a year steadily. Where it has existed for more than four weeks, the adjacent glands will also be found enlarged, especially those of the neck; for, as has already been remarked, eczema most frequently attacks the head. These glandular hypertrophies have the peculiarity of scarcely ever undergoing suppuration; but, after the eczema has been cured, gradually lessen in size, or remain slightly indurated for some time thereafter.

Eczema heals without loss of substance; but, on the hairless parts affected, a dark discoloration of the skin will remain, which disappears after several months. Relapses are of frequent occurrence.

Treatment.—The local treatment only will be discussed here, for the general will follow at the conclusion of the section. According to my thousand-fold observations, simple cleanliness, and, for the scalp, the removal of the hair, are entirely adequate to cure it. Even this last procedure is not absolutely necessary; it, however, accelerates the desiccation, and is of great benefit to children who are extremely annoyed by the agglutinated masses of hair and crusts.

Vain mothers, however, very unwillingly consent to have their daughters' hair cut off. It is true that children are much tortured during washing and combing of the hair, but it cannot be ignored that, even in this irrational, at times even cruel, treatment, a period finally arrives where no new exudations take place, and a normal skin makes its appearance after the dried scabs have fallen off.

The crusts are best removed after soaking them with oil; they thereby become soft, and may be taken away without causing any pain. The severe itching of the skin causes the patients to scratch themselves incessantly, but this also may be prevented to a certain extent by cutting their finger-nails as short as possible twice a week.

By *impetigo* we understand an inflammation of the skin in which small and large pustules spring up on an erythematous base, and then dry up into thick yellow or brown scabs. The exudation goes on beneath the crusts, elevates them, and for some hours the inflamed corium lies exposed, but soon becomes covered with new crusts. The course, the rest of the symptoms, and the local treatment, differ in no respect from those of eczema.

By *ecthyma* and *rupia*, large solitary pustules are understood, which give rise to temporary brown scabs, and then usually pass over into torpid ulcers. In most intances the inflammatory areolæ are insignificant, but, when the cachexia is very well pronounced, they become bluish red. The ulcers that form after the scabs fall off discharge hardly any secretion; indeed, are almost dry, but nevertheless heal very slowly, and frequently last until death. This eruption occurs only in emaciated, atrophic children.

Treatment.—An attempt should be made by the aid of stimulating ointments, ung. digestivum, or by lightly pencilling them with nitrate of silver, to induce a strong reaction in the torpid ulcers. The local treatment, however, remains fruitless, if no constitutional improvement can be brought about. The remedies which are indicated will be prescribed at the conclusion of the section.

Besides these vesicular and pustular eruptions, the corroding tetter, *lupus*, is yet to be described as being peculiar to scrofulosis.

Symptoms.—Lupus occurs in children under all the four forms which dermatology teaches. We have (1), a *L. exfoliata;* (2), *L. tuberosa;* (3), *L. exulcerans; and* (4), *L. serpiginosus, or ambulans.*

Lupus exfoliatus consists in large and small hypertrophied spots on the integument, having glistening ground-off upper surfaces, which constantly desquamate, and induce an intolerable itching. In color, these hypertrophied spots vary from a rosy to a bluish red. The induration is more marked than the projection above the level of the normal skin.

Lupus tuberosus differs from the first form only by the greater prominence of the tubercles, which, by aggregation, may swell up into large, bluish-red tumors, and sometimes feel hard, but sometimes also fluctuate. The desquamation and color are the same in character as in the first.

Lupus exulcerans, also called phagedænicus, seldom originates primarily as such, but generally develops itself from one of the forms just mentioned. It is characterized by hard cutaneous exudations, which rapidly liquefy, and leave behind deep, uneven ulcers. These ulcers discharge no pus, but a brownish ichor, and heal extremely slowly. They penetrate into the deeper structures, and do not spare even the bones. The crusts which, by the diminution of the discharge, form from time to time, are usually soon cast off.

Lastly, lupus serpiginosus is distinguished by the formation of deeper ulcers, which constantly become larger and larger by the disintegration of the new exudation deposited in the edges of the ulcer, while the parts first attacked contract, become flat, and assume a healing action. The cicatrices always remain white, depressed, and corrugated, and the loss of substance, especially when the lupus was located on the nose or eyelids, is very disfiguring.

None of these four forms ever occur in the healthy, but only in the cachectic, and, in fact, chiefly in well-pronounced scrofulous, less frequently in syphilitic children. Their site is preferably in the face, most frequently on the nose, next on the cheeks and lips, very rarely on the trunk and extremities.

The course is very chronic, and, in most instances, it takes years to cure them; the loss of substance is always considerable, and the cicatrices are visible all through life.

Treatment.—The local treatment of lupus, especially the corroding form, is of great importance. It is absolutely necessary to put a stop to the progress of the evil by a systematic course of cauterizations. Nitrate of silver is not powerful enough for these cases, and we have to resort to arsenic or chloride of zinc paste. Dupuytren's arsenic powder (ninety-eight or ninety-nine parts of calomel and one or two parts of white arsenic) is especially adapted for superficial cauterizations, when not too near the mouth and nasal passages. The ulcer should be cleansed, and the powder applied one-third or one-half a line in thickness, over which a layer of gum-arabic powder should be spread; the moisture of the ulcer soon converts the whole into an adherent paste. After from eight to ten days the paste falls off, but, in most instances, has to be reapplied several times.

Chloride of zinc paste is less dangerous on account of possible poisoning, and none the less efficacious. One part of chloride of zinc is mixed with two or three of starch-powder, stirred up with a few drops of water, and then applied upon the cleansed ulcer. The chloride of zinc corrodes to a depth equal to the thickness of the layer. The cauterization has to be renewed, after the eschar falls off, until a fine, granulating surface appears.

Without an internal treatment with cod-liver oil, continued for years, not even temporary relief will be attained by the most powerful escharotics. It is hardly necessary to state that it is not practicable to apply the chloride of zinc paste without anæsthetizing the little patient.

(b.) *Mucous Membranes and Organs of Sense.*—The morbid alterations of the organs of sense, with those of the mucous membranes, generally are treated together, because in scrofulous affections the organs of vision and hearing invariably participate in great degree with their mucous membranes.

The mucous membrane of the mouth and alimentary canal displays no characteristic scrofulous affections. Bronchial catarrhs, so frequent and tedious in scrofulous children, are much more probably produced by actual tuberculosis of the lungs than by scrofula. Likewise in the uropoëtic system no particular derangements occur; in the vagina, however, a tedious leucorrhœa is often observed in scrofulous girls, a more detailed description of which has already been given on page 468.

Marked scrofulous lesions occur only on the mucous membrane of the *nose*, of the *eye*, and of the *ear*.

NOSE.

A suppurating eruption, eczema, or impetigo, very frequently attacks the nasal cavities at the place of transition from the mucous membrane into the cutis, in consequence of which the former becomes hypertrophied, and discharges a large quantity of corroding secretion. The nasal cavities are finally totally occluded by the crusts, which constantly become thicker and thicker; the tip of the nose swells up, and the acrid secretion that flows down over the upper lip produces a chronic inflammation and infiltration of the integument of these parts. The tumidity of the nose and upper lip is of such frequent occurrence that the scrofulous diathesis is usually diagnosticated by it.

Although it cannot be denied that children so constituted are always scrofulous and suffer from still other scrofulous affections, nevertheless it does not follow that those who have no swollen nose and upper lip are not scrofulous too. This affection is by no means so frequent that it might be identified with the scrofulous diathesis.

The recovery requires months, and even years, and, when the eruption has finally disappeared, the infiltration of the cutis yet remains for a long time. These simple eczemas have nothing in common with lupus, polypous growths, and purulent coryza, or ozæna, nor do they generally pass over into such conditions.

Scrofulous ozæna consists of a bloody, purulent discharge from one or both nares, and is distinguished from the affections of the mucous membrane just described by the never-absent pungent smell of the matter that flows from the nose. It is also very tedious, disappears sometimes for several weeks, and then returns with its former severity. In most instances a periostitis of a part of the nasal bones is at the bottom of this complaint, and small necrosed pieces of bone are also occasionally discharged. This sufficiently explains the intense odor and the protracted course.

Treatment.—Injections of cold water or weak astringents render essential service when the children become large and sensible. In small children, who obstinately resist these measures, we have to be content with the use of a weak ointment of red precipitate (gr. iij to lard ʒ j), introduced into the nose by the aid of a thin bourdonnet. Here, also, the general treatment is the principal consideration.

EYE.

The Meibomian glands on the lids very frequently ulcerate. Many hordeola form, part of which pass over into suppuration, and part into induration. The adjacent parts of the eyelid are here swollen, and quickly become excoriated in consequence of the accumulated augmented secretion. This affection likewise lasts several months, and often terminates with total or partial loss of the ciliæ.

After several days these phlyctenulæ burst, the vessels running to them atrophy, and soon disappear altogether. When this process is completed, no permanent injury to the eye, nor any visible residue, is to be observed. But the case is entirely different where the cornea has been affected.

Keratitis scrofulosa presents itself either as a simple further development of the vessels of the sclerotic conjunctiva upon the cornea, so that radiating vessels run to it at one point, or around its whole periphery, or large or small ulcers form at some one point on the cornea.

These corneal ulcers likewise originate from pustules, which correspond to the phlyctenulæ of the sclerotic; here, however, they burst uncommonly quickly, and, in a short time from the commencement of the evil, no pustules are to be seen on the cornea, but, instead, a small, visible, shallow depression, the result of a loss of substance, around which the cornea appears hazy or of a milky opacity. The ulcers thus originated, of which several often appear at once, require a long time to heal up. The place where they were situated often looks as if ground off, but the smoky opacity of the base of the ulcer and its vicinity does not disappear for many years, or remains visible all through life—macula cornea.

In strongly cachectic individuals, the ulcers may penetrate deeper and deeper, and finally perforate the cornea. If the ulcer was situated centrally, so that the perforation, after the escape of the water from the anterior chamber of the eye, could not be closed up by the iris, phthisis bulbi generally ensues. But if the ulcer was situated more peripherally, then the iris prolapses, becomes covered with exudation, and the patients recover with a deformed pupil, by which the power of vision is but little diminished. At the place of union between the iris and cornea, a white spot with a black central point forms, from which a staphyloma may subsequently develop itself.

Perforation by the scrofulous ulcers seldom occurs; on the whole, hardly one out of a hundred perforates, and, of those which do, the favorable termination of prolapsus of the iris occurs comparatively often.

Blepharospasmus, spasm of the lids, is very characteristic of scrofulous inflammations of the eye. It is produced by the great intolerance of light, which is absent in a small number of cases only. Children will not open the afflicted eye throughout the whole day; during daylight they hide themselves in dark corners and rooms, keep their hands before the face, and hinder as much as possible the penetration of light into the eye. Although it must be acknowledged that complaisant, obedient children, after much persuasion, are finally induced to open their eyes for a moment, or at least submit to have them opened, nevertheless, in other cases, the penetrating light produces such violent irritation that the child, with the utmost desire to open its eyes, is unable to do it. Such a child may indeed be secured by assistants, and the lids forcibly torn apart by the hands, but some bleeding from the angles of the eye and swelling of the lids are always produced thereby.

Therapeutically, this violent tearing open of the lids is of no use whatever, for the treatment remains the same whether there are any ulcers or not; a palpable harm, however, may result from the marked swelling and unavoidable bruising of the lids. In regard to the prognosis, this procedure may be of more importance; for a perfectly favorable prognosis may be given to the profoundly afflicted parents, when none or only a peripheral ulcer of the cornea can be discovered.

The intolerance of light is not always in exact relation to the material alteration of the cornea; the former is often present to a high degree, and the latter structure entirely intact. Along with the intolerance of light there is always profuse lachrymation, and the tears, in common with the friction and constant pinching of the eyelids, the result of violent contraction of the orbicular muscle, soon produce a humid vesicular eruption of the whole moiety of the face.

Scrofulous inflammations of the eye relapse extremely often—it may almost be said, invariably. It takes at least half a year—

often, however, many years—before the subjects attain to such a condition as to properly enjoy life again. The violent, continuous pains, by which these affections are accompanied, usually produce also some fever and loss of appetite, upon which a visible emaciation of the whole body supervenes.

There is a very peculiar alteration of the ciliæ in chronic scrofulous inflammations. At first they grow to a singular length and thickness, but thereby lose their plain, arch-like curve, and become undulating, almost curled. Later, all these degenerated eyelashes fall out, and are replaced by fine, small, sparsely distributed hairs, which remain for life.

The alternating character of the different local manifestations of the cachexia is seen most distinctly in scrofulous ophthalmia. The corneal ulcerations may persist for many months, and constantly grow worse in spite of all local and general treatment, when, suddenly, an eczema attacks the head, or an otorrhœa, or a bronchitis, or a scrofulous affection of the bones, supervenes, and the obstinate inflammation of the eyes is completely gone in a few days. Intolerance of light, lachrymation, and vascular injections, have vanished, as if by magic, nothing but an opacity of the cornea remains, which, with the exception of producing a diminution of the power of vision, has no further bad effects.

Treatment.—Notwithstanding all rational and irrational, painful and painless, old and new remedies, which ophthalmologists have recommended in large numbers, there is still no method of treatment which notably exercises an aborting and mitigating effect upon the course of this pertinacious evil.

The eyes should not be allowed to be bandaged; a green shade, however, is beneficial. All ointments and collyria are, so long as redness and pain exist, injurious, and increase the irritation. There is nothing better for this inflammatory stage than tepid-warm, distilled water, with which the eye may be bathed and irrigated every hour. Cold applications, in most cases, aggravate the pains and redness.

The patients should not be encouraged in their efforts to entirely avoid the light. They should be provided with a plain shade—umbraculum—and be confined in a darkened room. Some benefit is derived from dropping into the eye a drop or two of a concentrated solution of atropine (gr. j to water ʒ ij) several times daily, and from the internal use of the extract of belladonna, of which gr. ss. may be given in the twenty-four hours. Immersions of the head in cold water have a decidedly beneficial effect upon the blepharospasmus; it is, however, but a few hours in duration. These procedures can only be executed under the violent struggles of the children and their parents; and the usual consequences are, that the former are not to be found when the time comes for the next immersions. I have therefore given up this somewhat brutal treatment for the last few years, and I think the results have been quite as favorable.

When the patients are not intensely tainted with tuberculosis, which is not the case, as a rule, they will tolerate inunctions of blue ointment very well, and a tolerably good, although not always more rapid course, is observed from this treatment. ℈ss—℈j of blue ointment is rubbed in upon the forehead daily, over which a broad bandage must be tied, for otherwise the children will smear themselves all over with it, and the ophthalmia becomes aggravated if any of the ointment gets into the eye.

Against severe pain, sleeplessness, and general excitability, morphine will always prove to be the sovereign remedy. I generally cause gr. ss. to be dissolved in ℥iij of water, and of this solution give half-teaspoonful doses, according to necessity. No bad consecutive effects can be perceived from such small doses of morphine; leeches, which formerly were often resorted to, likewise, on account of their pain-assuaging effects, may, however, cause much harm through consecutive anæmia.

When the course is an obstinate one, and no cutaneous eruptions are present, a rapid, remarkable improvement of the affection of the eyes may occasionally be seen from the production of pustules by tartar-emetic ointment. The Autenrieth's[*] ointment, however, is a totally inappropriate preparation for the purpose of attaining this end. The patients scratch the places where the ointment has been applied, and then rub their eyes with the soiled fingers, by which they palpably aggravate their ophthalmia. For a number of years back I have been in the habit of applying to the nape of the neck a mixture of one part of tartar. stibiat. and three parts of emplas. citrin., smeared upon strips of adhesive plaster to the thickness of the back of a knife. At the end of four days the plaster may be removed, when a number of pustules will be found to have formed, which may be kept in a state of suppuration for a long time by the use of ung. sabinæ.

Against the blepharitis and adenitis meibomiana, desiccating or slightly stimulating ointment may be resorted to. Here the white precipitate (gr. ij—iv to adepis ʒj) and ung. zinci are especially serviceable.

As has already been observed, all these remedies have no decided effect, and the principal procedure is always a year's continued, circumspect, general treatment.

[*] Ung. antim. et potas. tart.—Tr.

EAR.

Scrofula furnishes the chief cause for affections of the ear, especially chronic otorrhœas, the termination of otitis externa and interna. Diseases of the bones of the meatus auditorius, and of the petrous portion of the temporal bone, occur almost altogether in children of tuberculous parents, and are combined or alternate with other local affections of the cachexia. The morbid conditions belonging here have already been delineated in detail on pages 427 to 433.

(c.) *Lymphatic Glands and Subcutaneous Cellular Tissue.*—Swellings of the glands are of extremely frequent occurrence in scrofulous children, in most instances produced by adjacent affections of the mucous membrane, or of the integument. The lymphatic glands of the neck swell up most frequently; those of the axilla and groin not quite as often.

Pathologically, a distinction may be made between simple hypertrophy and tuberculosis of the lymphatic glands; practically, however, no such distinction can be maintained. One may often see that a child becomes affected with glandular swellings in the neck in consequence of an eczema of the head, and that these glands, which originally were simply hypertrophic, nevertheless, after the eczema has long been cured, pass over into suppuration, and become tuberculous. It is scarcely possible to separate the scrofulous from the tuberculous glands, for the transition of the former into the latter occurs gradually, and does not manifest itself by any precise symptoms.

Pathological Anatomy.—Numerous extirpations of hypertrophied glands, and multiplied *post-mortem* appearances, have shown that simply hypertrophied and tuberculous infiltrated glands may occur in the same person.

In the *simply hypertrophied* glands there is but a slight alteration of structure. The longer they have existed, all the firmer and denser becomes the substance. The superficial surface, in most instances, is very vascular; when cut into and compressed, a turbid fluid may be squeezed out, which, under the microscope, exhibits the characteristic glandular element, numerous granules, a few cells, and some connective-tissue fibres. Occasionally smaller and larger cavities, with clear contents, occur scattered throughout the parenchyma of the gland.

The *tuberculous glands* are always at the same time enlarged, and, on section, display either small hyaline, gray miliary tubercles, or large yellow tubercles, and aggregations of tubercles. In the severest form of the evil almost the entire glandular parenchyma will disappear, and be supplanted by a tuberculous mass. Suppuration is the usual termination of tuberculous glands; calcification seems to occur but very rarely in children. As the softening progresses, the parenchyma and adjacent cellular tissue become inflamed, abscesses form, and finally the well-known, slowly-healing fistulous tracts and undermining ulcers result.

Symptoms.—Tuberculous glands are most frequently situated on the neck, and a single gland alone hardly ever becomes affected; large convolutions, as a rule, may be felt on both sides of the neck, under the chin, and behind and beneath the ear. When the glands become enlarged very slowly and without any pain, they usually remain tolerably movable; in the contrary case, and particularly when they pass over into suppuration, they become tense and immovable. A lively pain, increased on pressure, then comes on in all cases, the integument constantly grows redder and thinner, finally breaks, and a flocculent, thin pus escapes, with which large tubercular granules are occasionally expelled. Generally several glands break open at one time, or soon after each other, at different places, and the suppuration is always extremely tedious. Very peculiar ulcers, with callous, extuberating edges and lardaceous bases, now form, from which irregular portions of the gland protrude.

Finally, after several months, the callous edges soften, the ulcers become clean and heal up, but not without the formation of disfiguring cicatrices. It is a remarkable fact that the general state of the system does not suffer here at all; the children look blooming, and thrive excellently well, provided the tuberculosis remains confined to the glands, and does not simultaneously attack the lungs, or some other vital organ. The course, aside from the disfiguring cicatrices, is, in the majority of cases, favorable; and usually, when the ulcers have once completely healed up, no new swellings and suppurations ensue.

As regards the complications, according to *Lebert's* famous researches, scrofulous ophthalmia precedes or becomes superadded in seven-sixteenths of all the patients, two-fifths of the cases become complicated with diseases of the bones, one-fourth with cutaneous affections, one-fourth likewise with diseases of the joints, and one-sixth with superficial ulcers and abscesses. According to the observations of the same author, tuberculosis of the glands is very rare between the first and fifth year of life, i. e., one-twelfth of its cases, more frequent between the fifth and tenth year, rate one-fifth; most frequent between the tenth and fifteenth year, viz., almost one-third of all its cases. From the fifteenth to the twentieth the frequency is still considerable, i. e., two-sevenths. From that time on, the disease becomes more rare; for, after that age, tuberculosis more frequently attacks the lungs than the lymphatic glands.

Tuberculosis of the lymphatic glands is of itself devoid of danger, but very generally tuberculosis of the lungs comes on after puberty, and prognostically, therefore, this danger must always be kept in view.

Treatment.—In the simple and inflammatory hypertrophy of the glands, the cause is, above all, to be taken into consideration. The glands never grow smaller so long as the scrofulous affection of the skin or mucous membrane, that has produced it, still continues. Not till after these have been cured, and the glandular hypertrophy does not disappear, may the effort be made to remove it by the local application of tincture of iodine twice or thrice weekly. Simple swelling of the glands disappears under such a use of iodine continued for some time, but tuberculous very quickly thereby become inflamed and come to suppuration more quickly. Still, this last process need not be looked upon as an unfavorable occurrence, because the tuberculous masses cannot be absorbed, and are really eliminated from the system in this manner.

The tuberculous softening at times goes on surprisingly slowly; it scarcely ever, however, fails to take place, for calcification rarely occurs in childhood. All cutaneous irritants seem to accelerate it, and it is therefore rational to employ them. Here belong all the salves and plasters which make the skin red and inflamed, and a large number of which are current as popular remedies.

The ulcers that have already broken are to be treated according to the generally-adopted rules of surgery. When the healing is protracted for too long a time, a marked progress may be perceived from the use of red-precipitate ointment. Against simple induration, iodine will always prove a sovereign remedy. The greatest caution, however, must be exercised, in its internal use, for the always-to-be-suspected pulmonary tuberculosis occasionally makes visible progress thereby. Mineral waters containing iodine and bromine are best adapted for long use. Hypertrophied glands may soon be reduced in size by the continuous local use of tincture of iodine; it will, however, very seldom be possible to remove them altogether.

Extirpation of glands can only come into consideration when the inflammatory phenomena have long ago disappeared, and only a few glands have remained hypertrophied. In the contrary case, the wound of the operation, instead of healing up, may be expected to assume the character of a glandular ulcer, with the well-known callous edges.

(d.) *Bones, Inflammation of the Periosteum* (*Periostitis Scrofulosa*).—Inflammation of the periosteum is not infrequently the manifestation of scrofula or local phenomena of other remote affections, and occurs either as an acute inflammation or has a chronic insidious and sometimes a very destructive termination. In rare instances a transformation of the primitive chronic into an acute periostitis may be observed.

The disease extends over a larger or smaller part of the bone; sometimes it attacks the periosteum of the bone in its entire circumference. Its site is generally on the long tubular bones of the extremities (tibia, femur, and humerus) and other compact bones; spongy bones are seldom affected.

The pathological character of acute periostitis, which occurs as often as the chronic, is distinguished by an acute injection of the periosteum, mostly in the form of a uniform redness and by a swollen, flocculent, and spongy appearance; later on, the periosteum is bathed in a muculent, tenacious, shreddy fluid exudation, and can be easily peeled off. In the insidiously-appearing periostitis, the hyperæmia is less intense, more in the form of a striped or spotted redness; the periosteum changes to a lardaceous, grayish-red, or grayish-white mass, which is less easy to pull off from the bone and adjacent soft parts. When the disease has existed for some time, the latter as well as the periosteum will frequently contain small spiculæ or lamellæ of newly-formed osseous substance; these are always apt to form whenever the periostitis is of some duration.

The additional alterations which the inflamed periosteum undergoes are as follows:

Complete *resolution* and *retrogression* to normal texture are extremely rare; a permanent *hypertrophy* and increase in bulk, with organization of the inflammatory product into solid tissue, occur somewhat more frequently, though on the whole likewise rarely; the termination in *suppuration* or *sanies* is predominantly frequent. In the latter processes pus forms in the inflamed periosteum as well as in the adjacent soft parts, which, uniting with the purulent collections in the bone, may form one large purulent reservoir. If the pus breaks outwardly and the periostitis was limited to a small, circumscribed spot, healing and cicatrization may indeed ensue, still these are very rare occurrences; the periosteum, as a rule, is undermined to a great extent, and separated from the bone; the latter is thus deprived of its nutritive conditions necessary for its existence, and the next effect is necrosis. In other cases, and when the influence of the scrofulosis continues, the suppuration assumes the character of ichorous liquefaction, which also extends to the subjacent bone, and induces in it the same process—caries (S. caries and necrosis).

Scrofulous periostitis less frequently indicates tuberculosis than scrofulous ostitis, for tuberculous masses often appear as the inflammatory product of the last. The symptoms of scrofulous periostitis are in general those of ordinary periostitis, and differ according as to whether the course is acute or chronic. In most cases there is at first a local, not distinctly-defined pain, diffused along the length of the bone; it has a peculiar dull character, and is aggravated on pressure. Soon the pain, which at the commencement was only transient, becomes more constant and severe, particularly in bad states of the weather, frequently also at night. The afflicted limb swells faster or slower according to the character of the inflammation, the skin becomes tensely stretched, and can no longer be raised in folds; in the first stages the tumefaction is hard and dense; when suppuration ensues, one or more soft places will be found, then distinct fluctuation, and finally the abscess breaks, after the cutis has become bluish red in color and the epidermis elevated. Spongy granulations, which bleed at the slightest touch, exuberate from the openings, which often rapidly become enlarged. The pus that escapes differs in character according to the depth the processes run (caries or necrosis).

The general condition of the system, in the chronic course, is often but little affected, if it is not disturbed at the same time by other remote scrofulous diseases; on the other hand, in the acute as well as in suppurative stages it is always attacked by febrile phenomena, which may attain to hectic fever in the case of extensive profuse suppuration and weakness of the individual, which are frequently present. It terminates with the destruction of the patient.

According to the described symptomatology, it will not be especially difficult to form the diagnosis.

The *prognosis* must be put down as unfavorable, on account of the caries or necrosis which so frequently follows. The periostitis, even before these processes have distinctly developed themselves, may endanger the life of the patient by profuse suppuration.

Therapeutics.—The treatment, at the commencement, should be with resolvents, although these will bring about the desired effect in the smallest number of cases only; in addition to these, pain-assuaging remedies (internally and externally) must be employed, combined with absolute rest of the afflicted limb. Cataplasms, as a rule, relieve the pain very quickly, and for a long time, especially in commencing suppuration; but, as soon as that is clearly ascertained, the abscess should be punctured, for, if it is delayed, the rapid accumulation of matter will extensively separate the periosteum from the bone, and large portions of it will be destroyed in most instances.

Inflammation of the Medulla of the Bones (*Osteomyelitis—Endostitis*).—Inflammation within the medullary canal of the tubular bones occurs tolerably frequently in scrofulous persons. The anatomo-pathological conditions of this affection are: hyperæmia, with dark-red discoloration of the marrow, conjointly with which small extravasations of blood now and then also occur, followed by suppuration, at first at small scattered places, which spread more and more, while the hyperæmia subsides. The medulla retains a dirty, brownish-red color, and liquefies; the bony walls are seen either discolored, pervaded by granulations and ichor, undergoing absorption, and becoming carious, or, when the suppuration of the medulla increases rapidly, they are seen to lose their supply of blood, and to be attacked by necrosis (caries and necrosis centralis). After a while the affection may attack the bone in its whole thickness, implicate the periosteum, and induce the same processes, which will be described in detail in the inflammation of the osseous structure and its terminations. The symptomatology and therapeutics are also almost identical with those of that affection.

That form of inflammation of the marrow appearing in scrofulous subjects, in which the contents of the medullary spaces, and the cancellous structure of tubular bones, especially those of the hand and foot, appear inflamed, is of more frequent occurrence than the above; inflammation of the periosteum is always present with it. The process, which in its subsequent stages is known as osteoporosis, osteospongiosis, *spina ventosa*, is of such a character in the first periods that all the osseous cancelli, and the medullary cavities, are found filled with dark-red, bloody fluid, rich in cells, sometimes even with purulent degenerated marrow, while the periosteum is seen hyperæmic and swollen. At a further stage of the evil, purulent dissolution and absorption of the osseous substance take place within the bone through the inflammatory action, by which the cancelli attain to abnormally large size, while, externally, irregularly, thin bony lamellæ form, from the similarly-inflamed periosteum, and, in part, are again destroyed by the process of absorption which goes on from within. In this manner the bone may increase in bulk enormously, while its substance has, nevertheless, become diminished, for its internal part consists of very large, coarse meshes, large cavities, or irregular cells, very much as if the bone has been strongly inflated (therefore, also, the name spina ventosa). In the developed state of the affection, it is impossible to distinguish the cancellous structure from the medullary cavities.

The affection frequently occurs, in scrofulous children, on the hands and feet, and generally on the metacarpal and metatarsal bones, or the phalanges, which often become expanded and misshaped, and present bulbous or globular swellings (similar to the enchondroma on the fingers, which the process under consideration also resembles in this respect: that in it, as a rule, the joints remain free or unaffected).

The process often does not attain to suppuration, but, when it does, numerous fistulous openings will form; most of them, however, remain small.

Therapeutics.—By the use of proper remedies, directed against the fundamental disease, in addition, by bathing the afflicted limb (either with tepid or alkalescent water), and by a compressive bandage, applied for a long time, a cure may not infrequently be performed with but slight deformity.

Inflammation of the Bony Structure (*Ostitis Scrofulosa*).—Inflammation of the osseous tissue frequently occurs in scrofulous children, and has its site chiefly in the spongy bone-tissues (in the irregular and short bones of the extremities, in the epiphyses of the long bones, the vertebræ, etc.); still, it also occurs in the flat, compact, and tubular bones; in fact, no bone of the skeleton is excepted.

An inflammatory nucleus forms at some part of the bony structure, which quickly gains ground, or several originate, and then become confluent, under more or less marked hyperæmia, which may attain to actual extravasations of blood. The cancelli of the bone are superabundantly filled with an oleagino-gelatinous fluid, which is soon supplanted by granulations, displaying a profuse quantity of cellular structure; the cancelli of the bony-tissue become larger as the granulations produce an absorption of the osseous tissue (osteoporosis). The bone itself, at the inflamed place, appears larger in bulk, although its structure has not increased, but, on the contrary, become diminished. This condition becomes particularly apparent when the inflammation is situated near the superficial surface of the bone. Abscesses are also often seen to form in the adjacent soft parts, even when the inflammation is situated in the depth of the bone, and does not involve its superficial surface.

In scrofulous subjects the *tuberculous* inflammation, which attacks especially the spongy bones and epiphyses, is the form which most frequently occurs. Accompanied by hyperæmia, one or several nuclei, of a globular form, or a uniform infiltration of the osseous substance, with a semi-transparent, yellowish-gray, gelatiniform exudation, takes place. When there are only a few scattered nuclei, some of them will be surrounded by a sort of envelope, which likewise enwraps the exudation, but it disappears in the progress of the lesion. Softening soon takes place, the several aggregations turn to a yellowish color, a crumbling, cheesy matter is seen in the thick, pultaceous fluid, and, when the process goes on faster, and is more extensive, small fragments of bone will not infrequently be found. By this process cavities form in the bone, which, by constant extension and approximation, will finally unite into considerable-sized caverns; the bone becomes rotten, and crumbles down, as it were, within itself. In the first stage, recovery may take place by the fluid contents of the nodes becoming absorbed, and these undergoing calcification, while the bony tissue near them becomes condensed; but the breaking of the abscess, and evacuation of the tuberculous matter, with a continuation of the process as tuberculous caries, which then passes through its various metamorphoses, are of more frequent occurrence (S. caries).

Tuberculous infiltration attacks either a whole bone or a part of it —a vertebra, for example—in this manner: a bone is pervaded by the yellowish-gray inflammatory product, and a number of yellow streaks and spots soon appear, which rapidly become enlarged, coalesce, and consist of purulent fluid, intermixed with crumbling granules, which quickly assume the character of a puriform ichor or sanies. Under its influence the bony tissue soon breaks down into small or large particles, which are sometimes found in the ichorous fluid that is discharged. If the process goes on still further, it may next also involve the periosteum, destroy it, and cause death and exfoliation of the bone. In other, rarer instances the disease becomes arrested after the exfoliation of the infiltrated parts, and a recovery takes place by the cancelli becoming filled up with granulations which spring up from the still healthy adjacent part of the bone, or from the periosteum and its vicinity. The *terminations* of inflammation of the bony substance, after it has existed as such for a longer or shorter period, are:

(1.) *Resolution.* Complete resolution is an exceedingly rare occurrence in scrofulous persons, and is only observed in inflammations implicating small portions of a bone.

(2.) *Suppuration*, with subsequent healing without transition into caries. The transition into suppuration occurs tolerably often; a cure, however, is rarely effected after the breaking and evacuation of the abscess have taken place; in most cases purulent infiltration and protracted caries then follow. In this termination the cancelli are distended, enlarged, and full of pus, and, as the bony substance breaks down, larger or smaller cavities form—a process which may go so far that finally but one cavity is to be found, extending throughout the whole bone, having only a thin osseous shell, which constantly grows still thinner, covered by periosteum—abscess of the bone. If the matter has tunnelled its way into the soft parts, it may then either break through, especially if abscesses preceded by inflammation have already formed in these, either in a straight direction, corresponding to the site of the affection, or it may travel on for a distance between them, and appear at a greater or lesser distance from the original place. The pus is yellow or yellowish white, devoid of any bad odor, in most instances somewhat thin, and has no corroding properties (it is said to contain a larger quantity of phosphate of lime—$\frac{1}{120}$ to $\frac{1}{110}$—than pus formed in soft parts—$\frac{1}{300}$). The pus continues to be discharged for some time, and when, in favorable instances, it ceases, the orifice will close, and the cavity becomes filled with granulation, in which, in the course of time, ossification takes place.

(3.) *Caries.*

(4.) *Necrosis.*

Both these terminations of inflammation present such noteworthy peculiarities that they have to be considered separately. The *symptoms* of ostitis vary according to its site and extent, and as to whether the soft parts are implicated in the inflammatory process or not. Pains are never absent. Sometimes they are stationary, and then again migratory and radiating.

The tumefaction of the affected parts also varies, and, as a rule, it is difficult to decide how much is due to the œdema of the soft parts, and how much to the hypertrophy of the bone and periosteum. The integument is mostly very sensitive and inflamed, particularly when abscesses threaten to break through. Not infrequently such abscesses originate in the soft parts, without any connection with the affection of the bone, break open, cicatrize, and leave behind irregular, depressed eschars.

In chronic ostitis the general condition of the system may be but little perturbed, and only participates when suppuration sets in through febrile phenomena, etc.; in ostitis that occurs with acute fever, emaciation, debility, disturbance of the sleep, loss of appetite, and diarrhœa, are but seldom absent.

Treatment.—When the course is slow and the pains moderate, iodine ointment and mercurial plaster (when the general condition allows the use of the latter remedy) may be employed for the purpose of bringing about resolution, or vesicants and setons, as derivative remedies; in the acute condition, in consequence of the very severe pains that are present in the great majority of cases, pain-assuaging remedies will have to be resorted to along with absolute rest of the limb, as resolution is altogether out of the question: cataplasms, often repeated; when the exacerbations are intense, ice and cold irrigations are remedies which are better tolerated than is generally believed.

When the abscesses have broken externally, the treatment must be conducted with a view to facilitating the discharge of the matter: injections into the fistulous passages and cavities are often necessary.

ULCERATION OF THE BONE (*Caries, Ulceratio Ossis*).—In scrofulous persons, caries most frequently develops itself from a primary ostitis in one or several bones, and is predominantly frequent in the spongy bones; it is produced less often by periostitis as a result of the ulceration of the periosteum having been propagated upon the bone. Caries, therefore, almost always progresses from the centre toward the periphery, from within outward (caries centralis, c. profunda), or, in the rarer cases, from without inward, from the periphery toward the centre (caries peripherica, c. superficialis). Sometimes it is circumscribed, and thus presents the peculiar abscess of the bone; sometimes diffused; sometimes, again, involving only solitary parts of the bone, and then, again, its entire circumference (caries partialis and totalis).

Caries develops itself, after the above-mentioned inflammatory processes, in this manner: the granulations secrete a reddish-brown fluid, which, in common with the degenerated fat-cells and the sparsely-present pus-corpuscles, represent the ichor with which the cancelli become filled; then gradual atrophy of the osseous trabeculæ takes place, by which the bone so affected becomes soft and compressible, and finally disappears altogether by the destruction which attacks layer after layer.

Frequently, the bony substance is not destroyed by the gradual atrophy and degeneration alone, but also by necrosis, as normal parts of the bone lying next to the carious or already-ulcerated parts are deprived of their nutrition, die of themselves, and form larger or smaller sequestræ (caries necrotica).

The ulceration of the bone also spreads upon the surrounding parts, which, as a rule, have already been affected by preceding inflammation. The periosteum undergoes destruction through the purulent infiltration of the soft parts; the cellular tissue, particularly where the periosteum is destroyed, is attacked by ulceration; in it large and small abscesses and sinuses form, and finally one or more break outwardly, and the carious ichor escapes. In the soft parts, particularly those in the vicinity of the periosteum, osteophyte formations are frequently found.

The discharge, in most instances, is thin, of an insipid, nauseous odor (resembling putrid flesh), mixed with particles of bone, or, in tuberculous caries, with cheesy granules and flakes, and likewise with small bits of bone. Soft fungous granulations exuberate around the mouth of the sinus, frequently blocking up its entrance, and bleed at the slightest touch. The fistulous tracts, as a rule, run in a straight or oblique direction to the affected part of the bone; sometimes they also make many twists and curves, for the discharge does not reach the upper surface of the bone in a straight but in a roundabout way. The affected part of the bone will be reached by the probe with more or less difficulty, according to the course of the sinus, and is felt to be rough and uneven, as if worm-eaten, and easily impressible. (Probes, lead-plaster, etc., when brought in contact with the discharge, become discolored by the combinations of sulphur it contains.)

The general state of the system suffers but little in caries, in case small bones at a distance from the centre of the body are attacked. In other cases, for example, caries of the vertebræ (s. spondylarthrocace), it will be deranged in the highest degree. In the great majority of cases recovery will not take place until the cachexia, which lies at the root of the evil, is eradicated, and even then the caries sometimes goes on until the affected bone is destroyed, and, in fact, involves yet other adjacent parts. If recovery is to take place, suppuration and atrophy of the bone have to cease, the granulations then become firmer, more consistent, and richer in fibrin; from these, as well as from adjacent structures, preferably from the hypertrophied periosteum, ossification next ensues, by which the loss of substance is remedied.

The diagnosis, as well as the prognosis, is in greater part inferable from what has already been said. If it is not possible to reach the carious bone even with the probe, owing to the complicated course of the sinuses, the diagnosis can be established with perfect safety from the quality of the pus, the appearances of the orifices of the sinuses, the whole manner of origin, in unison with the locality of the nature of the bony part (*spongious bone*), and the nature of the general affection.

Treatment of Caries.—The local treatment consists of bandages and moist compresses, or moist pledgets of charpie, which have to be zealously renewed, while the affected limb is kept in such a position as not to hinder the escape of the pus. Hæmorrhages from the spongy granulations are best controlled by touching them with lunar caustic, or some mild astringent, and a graduated compress. Topical baths are worthy of recommendation, and, whenever the locality permits of their application (hand, foot, etc.), should be employed. Besides warm-water baths, alkaline and sulphurous baths, for the sake of cleanliness, should be frequently ordered, and, when very severe pains are present, they may be rendered narcotic by the addition of laudanum, etc.

General baths are likewise very beneficial, still they should not be employed where there is any great degree of debility, nor should any danger be combined with the bathing (for example, in caries of the vertebræ). Abscesses which are in direct connection with the bone or periosteum, and fluctuate distinctly, should be opened; congestive abscesses as late and as seldom as possible.

Consistent operative procedures may be resorted to in caries, having for their object the exsection of smaller or larger portions of bone, and even amputations and exarticulations. But the indications for these depend so much upon the circumstances of the individual cases, in reference to their local affections and general state of the system, compared with the benefit that can be derived from an operative undertaking, that no general rules can be laid down.

NECROSIS, GANGRENE (*Death of a Part of a Bone*).—Necrosis of the bones may be brought about in scrofulous subjects by inflammation of the periosteum, of the bone-substance, or of the medulla, in which the bones, through the uprooting of the periosteum, or of the endosteum, by impermeability of its vessels, as an effect of obstruction or pressure by exudation, having its usual nutritive conditions destroyed, must die. In this manner all causes and incentives of caries may also induce necrosis.

Necrosis usually attacks only one part of a bone, and generally either the external bone lamellæ as necrosis externa (n. superficialis), or the inner lamellæ of a medullary canal, or a portion of the spongy bone-substance in the depth, as necrosis interna (n. centralis); it may also involve the bone in its entire thickness, even in its complete totality (necrosis totalis).

Necrosis, it is true, occurs in scrofulous subjects on all the bones, still certain bones are predominantly often affected, especially the diaphyses of long tubular bones (tibia, femur, humerus, radius, and ulna); next to these the flat bones of the skull. In the spongy bones it is observed in common with caries; aside from that, these are less frequently attacked by necrosis. The process of necrosis presents somewhat different features according to its site.

(a.) In central necrosis (necrosis interna) the separated piece of bone that has been deprived of its nutrition—the sequestrum—lies in a cavity lined by granulations—sequestrum capsule—the walls of this cavity consist of old and new bone, which may just as well be formed in the medullary canal as upon the upper surface of the bone by the inflammatory process which is present here and there; the osseous substance subsequently becomes compact, and the bone on that account appears thicker and larger in bulk. A variable number of openings, lined by granulations, form in the sequestrum capsule, which are continued into the cavity, and terminate externally—cloacæ.

The orifices on the bone are round, oval, of various sizes, and surrounded externally by walls of granulations; pus escapes from them so long as the sequestrum is enclosed in the capsule, and, although they occasionally heal up temporarily, still, as a rule, they always break open again.

When the sequestrum is removed the cavity fills up with granulations, and immediately thereafter with compact bone-tissue—provided the general system has not been very much reduced—the sinuses, in most cases, close up with contractions of the soft parts, which remain visible for life.

(b.) In superficial necrosis—the result of periostitis—the sequestrum is not, as a rule, entirely enclosed in a capsule. This form has a more favorable chance of being cured, as the sequestrum is more readily expelled or may easily be removed; the sheath in which it was confined becomes filled up with granulations, and the opening closes up with a cicatrix contracted down to the bone.

(c.) In necrosis totalis a complete capsule forms, although rarely, by the peripheral formation of new bone on the border of the sequestrum, the capsule is complete, has a large cloaca, and the soft parts are mostly intersected by sinuses of considerable size and width. If the bone has been cast off, the large cloaca will be filled up with granulations continuous from the sequestral surfaces, the periosteum and the rest of the soft parts, in which bone-substance forms, in a longer or shorter time.

(d.) Necrosis of the entire bone occasionally occurs, in scrofulous subjects, on the hand and foot, and is always the result of intense periostitis and ostitis. The sequestrum, which consists of the entire bone, exhibits therefore the most traces of inflammation, and is sometimes carious in a high degree, osteoporotic, and lies in a wide cavity filled with ichor and pus. After the sequestrum is removed, the cavity may become filled with granulations, and new circlets of bone may be formed from the hypertrophied periosteum and soft parts.

In regard to the symptomatology of necrosis, every thing is essentially applicable that has been said in the consideration of periostitis and ostitis. When the abscess has broken or been opened, dead bone, if the process has already attained to necrosis, will be reached through the opening. In most instances this necrosed bone, when struck, will emit a dull, dead sound, and is felt to be smooth and firm; still, in total necrosis of the spongy bones, it is also very rough, uneven, and fragile. It is very difficult, in such cases, to distinguish between caries and necrosis, especially since the discharge from the sequestrum capsule may also be ichorous.

As regards the prognosis, it is most favorable in superficial necrosis; doubtful when the affection is located deeper, and extends over a large portion of the bone; and unfavorable when the entire thickness of the bone has been involved. In strumous persons, the intensity and extent of the inflammation, and the subsequent suppuration, tend to endanger the accession of hectic fever. The fact is of great importance, that such cases, as a rule, can only be relieved by an operation, which of itself is not dangerous.

The treatment, besides the subjugation of the cachexia, which lies at the bottom of the malady, should especially be directed to the expulsion or artificial removal of the sequestrum as quickly as possible. In superficial necrosis this indication is readily enough carried out; it is only necessary to open the abscess that is forming, or to dilate the already-existing opening, and to extricate the sequestrum, provided it is completely detached from the bone; but where this does not happen to be the case, then we should patiently wait, and use only simple dressings and bandages, in preference to all serious undertakings, such as cauterizations with the actual and other cauteries, exsection, etc. In encapsulated necrosis (the central, and frequently the total), there is always a mechanical impediment which prevents, or at least retards for a long time, the expulsion of the sequestrum, and it has to be removed by mechanical means, as too long delay tends to induce unfavorable accidents. The means of extracting the sequestrum from the capsule that surrounds it consists in enlarging the orifice sufficiently by the aid of the trephine, osteotome, small saw, or chisel, after which the dead bone is pulled out with the bone-forceps, etc. The filling up of the cavity with granulations, the cicatrization, and the rest of the recovery, are patiently waited for; a simple compressive bandage is employed, and the general system is improved as much as possible by appropriate remedies.

INFLAMMATION OF THE VERTEBRÆ IN SCROFULOUS SUBJECTS.—*Tuberculous Destructive Inflammation of the Vertebræ*, *Tuberculosis of the Vertebræ*, *Spondylarthrocace*,* *Malum Potii*, *Kyphosis Paralytica*.—This evil, of such frequent occurrence in scrofulous children, originates generally as a local manifestation of scrofula without any demonstrable cause; in some instances, however, it is produced in scrofulous subjects by traumatic influences, as falls, blows, etc. The nature of the disease is an inflammation of one or more bodies of the vertebræ, having the tuberculous character and the very marked tendency to deliquescence and ulcerative destruction of the bone. The affection, as a rule, appears in the form of ulcerated tuberculosis—according to the above-described precedents—less frequently as decapsulated tuberculous nodules, generally in the centre or near the centre of the body of a vertebra. Those cases in which the vertebral laminæ, transverse or oblique processes, are primarily attacked, are extremely rare, and the affections of the articulating surfaces are still rarer. The intervertebral cartilages, it is true, undergo destruction, but only secondarily, when the disease encroaches upon them, or when the vertebral bodies sink together with resulting curvature. This happens after the bodies of the vertebræ have become entirely, or in greater part, infiltrated, when cavities have formed by the dissolution of the tuberculous masses, so that the vertebræ are no longer able to support the parts resting upon them. Curvature then results, in most cases backward (kyphosis), but, as a rule, is combined with more or less marked lateral distortion (scoliosis, kyphosis scoliotica); it mostly originates gradually, seldom rapidly; in very rapid softening, the result of an injury to the diseased place, etc., it is very sudden, and necessarily attended by alterations within the spinal canal, hyperæmia, inflammation, and softening of the spinal meninges, and of the cord, and compression of this organ, without, however, inducing in all cases serious phenomena; indeed, these are very slight in some. In curvature of the spinal column the sympathetic nerve experiences a violent strain; still, nothing positive is known in regard to the symptoms thus produced.

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* The name spondylarthrocace, most frequently employed for this disease, is not well chosen, as the vertebral joints participate only secondarily, and may even remain perfectly free.

The affected vertebræ generate and support, in their immediate vicinity, an inflammatory process, which soon terminates by profuse suppuration. Purulent accumulations form; most of them extend far down as psoas or depending abscesses on the anterior surface of the spinal column to below the inguinal region, or into the pelvis. Posteriorly also—on the dorsum—such abscesses make their appearance, sometimes attaining to enormous sizes. These abscesses break but very rarely into the spinal canal. They contain thin pus or ichor, mixed with decomposed or degenerated tuberculous masses, as also fragments of bone and ligamentous shreds; in most instances the matter has a very pungent, nauseating odor, colors the probe black, etc. (S. caries).

In the contiguous parts, on the other hand, new formation of bone may be combined with destruction of the vertebræ, and the adjacent vertebræ, or the spaces between the laminæ and the processes, may also frequently be found studded and filled out with dentated, irregular bone-substance. Spontaneous dislocation of the vertebræ, with the exception of the first two cervical, has very seldom been observed.

The first signs of the disease relate to the spinal column, and consist in painful sensations emanating from it. Small children are restless, display symptoms of discomfort, cry when the back is touched, or when they are moved about quickly; larger ones carefully avoid these, and sometimes complain of stationary, and sometimes again of fugitive pains at the diseased part, or in its neighborhood.

An attentive examination of the back and spinal column should be instituted at the very commencement of the complaints of pain; the back and spinal column should be felt and percussed all over, and the patient should be made to perform various bodily movements, for by this it will be more easy to define accurately the location of the pain. With these local symptoms there are also general phenomena present when the disease has once attained to any degree, for, loss of appetite, febrile excitement, sleeplessness, and diminution of the mental abilities, soon come on.

At a further stage of the evil, important local derangements supervene, namely, curvature of the spinal column backward and laterally, with which a deformity of the thorax progresses hand in hand, for the ribs stand off at a greater distance on the side of the convexity of the curvature than on the concave side. With this, modifications in the remote phenomena, according to the locality which the affection embraces, manifest themselves.

(1.) Spondylarthrocace thoracica begins in the manner described; in addition, the patients complain of pains in the limbs, of a tickling sensation and formication in the calves and thighs, of pressure in the præcordia and abdomen; and not infrequently spasmodic affections in the parts mentioned also become superadded, quickly followed by constipation and difficulties in the nutrition. Every movement of the vertebræ is studiously avoided; the neck is drawn backward and shortened as much as possible, so that the head seems to be stuck in deeply between the shoulders, the elbows are kept at the sides, and the hands rest on the thighs, the arms thereby forming a support to the upper part of the body. Psoas abscesses now form, paralyzations supervene, the general symptoms assume the character of hectic fever, not infrequently accompanied by Bright's degeneration of the kidney, and death ensues after a shorter or longer period. Still, the patient, if his strength has not been exhausted in too great a degree, may escape with his life (a not very frequent occurrence, it is true, in any stage of the local affection), of course, with an incurable curvature of the spinal column and thorax, along with paralyzations of the lower extremities, rectum, and bladder, which, as a rule, likewise defy all manner of treatment.

(2.) Spondylarthrocace cervicales, angina Hippocratis.

The further downward toward the thoracic spinal column the affection is situated, all the more resemblance has the morbid picture to the one just sketched; but, in addition, the phenomena on the part of the upper extremities, in the form of spasmodic or paralytic derangements, come into consideration; the further upward the disease, all the more plainly the symptoms manifest themselves on the part of the digestive, vocal, and thoracic organs. (Hence the old denomination, angina Hippocratis.) In this form of the disease, swelling of the region of the neck is observed, which sometimes attains to a considerable size, and the place of curvature may thus remain hidden by it from the examining finger. These swellings, in most instances, are tense, firm, and hard, and have hence acquired the name of "tumor albus nuchæ" (analogous to the tumor albus of the joints). The greatest danger attends the disease when it is situated on the first and second cervical vertebræ, because at this point it may readily lead to compression of the medulla oblongata,* and, owing to the importance of this organ, to a speedily fatal termination. The cause is, the great mobility of the joint connections, so soon as the ligamentum transversum atlantis is destroyed or materially injured.

The movements of the head are painful; they are avoided as much as possible,† and the nape and neck are kept stiff, or the movements of the head are aided by the hand. Generally the pains in the head are quite severe, and torture the patient very much, especially at night; the difficulty of swallowing is frequently great, particularly when the disease has reached the stage of the formation of retropharyngeal abscesses, which, owing to the magnitude which they occasionally attain, may altogether prevent the patient from partaking of food or drink. This form of caries of the vertebræ, when the disease is to any degree intense, kills the patient either by the above-mentioned luxation of the upper cervical vertebra, or by its invading the meninges and brain, or through exhaustive discharges. Milder forms may improve and terminate in recovery—as a rule, with permanent or difficult-to-be-improved deformity in the attitude of the head. (A kind of caput obstipum [torticollis] is indebted for its origin to this disease.)

(3.) Spondylarthrocace lumbalis and sacralis.

The site of this form, which is least frequently observed, is the lower section of the lumbar spinal column, the sacrum, and also a contiguous part of the coccyx in rarer instances. The real pains are not infrequently preceded by unpleasant sensations in the thighs—in the form of ischias. The child lies in bed, on one side, with contracted thighs, is only able to rise with great difficulty, in which act it is obliged to support the region of the buttocks or hips with the hands (therein bearing some resemblance to coxitis). Purulent collections take place in the pelvis and may escape through the obturator foramen or into the rectum; they seldom make their appearance in the inguinal region. Paralysis of the sphincters and bladder is rare, as the affection is located deeply, and the nerves which control these organs are found above the site of the disease. Life is jeopardized by the suppuration with its effects; fatal meningitis or myelitis has also often been seen to ensue.

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* Either by the spinal column curving at a very acute angle, or by the dislocation of one body of the vertebra from the other, thereby compressing or even tearing the medulla oblongata.

† The child (as in a case at present under observation), when desirous of looking at an object at its side or behind, rotates the whole body toward it.—Tr.

Therapeutics.—The treatment, besides being directed to the subjugation of the cachexia, should be conducted with the view of preventing the spreading of the disease upon delicate structures, the brain, meninges, and spinal cord. Every mechanical violence and all injuries to the spinal column in particular, when the disease is confined to the upper section—for the reasons mentioned—are to be prevented with the utmost care. To accomplish this indication, a horizontal posture on the back, or, if this be impossible, the lateral decubitus upon a good upholstered mattress, should be prescribed for the patient so long as the morbid process is active, and he should be retained in that position, by mechanical appliances, under all circumstances. In order not to deprive the patients of the enjoyment of fresh air, they should be taken out upon the couch as often as possible.

Besides the internal use and local application of narcotics in the form of opium and ointments containing morphine, derivatives will have to be employed against the violent pains. Small blisters (upon which morphine is subsequently strewn) are very advantageous. The seton, however, will not infrequently be found to be more potent and none the less advantageous against the intense painfulness.*

Depending abscesses, that are not voluminous, should be left unopened as long as possible, since the disease, in most instances, makes more rapid progress after they are opened: if they have attained to great dimensions, are attended by excessive pains, and redness and inflammation of the integument, indicating their approach to a speedy bursting, they may be opened and the pus allowed to escape.

(c.) *Joints.*—Inflammations of the joints occur very frequently in scrofulous individuals as local manifestations of the general disease, without it being possible to demonstrate any other external cause, and are, as a rule, attended by other phenomena of scrofula in some remote part of the body. Pathologically, these inflammations differ in no essential respect from others that have originated through injuries, rheumatic influence, etc., but their phenomena derive a sufficiently peculiar character from the general disease which lies at the bottom of them. They begin and terminate either in an acute or chronic form, and take their origin either from the epiphyses of the bones that enter into the formation of the joint, or from the membrane which lines the joint, the synovial (sometimes from both at the same time), and in this manner present in the former case the clinical picture of arthrocace, in the latter that of the fungous inflammation (tumor albus).

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* As in every other grave local disease attended by excessive pains, so also here, the hypodermic injection of morphine will be found to be an invaluable means of allaying the pains without running the danger of deranging the digestion by the internal use of narcotics.—Tr.

I.—Arthrocace.

The spongy joint-ends are attacked by inflammations which terminate in suppuration and caries, after the manner described in ostitis, etc. Suppurative degeneration (deliquescence) sets in, the cortex of the bone is involved in the carious process, and becomes perforated, abscesses form in the surrounding soft parts, while the pus or ichor, after the destruction of the cartilaginous part, tunnels a passage for itself toward the cavity of the joint, and quickly sets up in it a suppurative inflammation. After the cartilaginous coating of the joint has become disintegrated, and the synovial membrane and the ligamentous apparatus destroyed, the carious joint-ends of the bones will protrude into the enlarged cavity, which is filled with ichor, by which exfoliation of the joint-ends of the bones not infrequently takes place. Dislocation of the ends of the bones is very apt to ensue, as the coaptating apparatus is attacked by the destructive process of the disease.

The kind of inflammation just described attacks the hip-joint most frequently of all.

II.—Fungus Articuli.

In other instances the synovial membrane is found predominantly affected. In the incipient stages of the inflammation it is seen to be lax, injected, covered with small projections—granulations. It has a villous or varicose appearance; by-and-by these granulations exuberate into shaggy, bulbous, inosculating excrescences, which project into the cavity of the joint; the synovial membrane is thickened, infiltrated, and permeated by pus. The vicinity of the joint also participates in the inflammation; the cellular tissue and the ligaments of the joint, etc., are infiltrated with a gelatinous or lardaceous material, and pervaded everywhere by plethoric exuberations of connective tissue in the form of spongy masses. In consequence of the suppuration, the soft parts are not infrequently perforated by sinuses coursing in various directions, which often reach the immediate vicinity of a joint, in order, after perforating the capsule, either to terminate into it from without inward, or in a contrary manner. The subcutaneous cellular tissue is infiltrated, in most instances, with serum, and in a state of hypertrophy; the integument is tense, white, and glistening, so long as no opening has formed (a phenomenon which is often protracted for some time); hence the older denomination, tumor albus. The muscles around the joint generally become flabby, and atrophic, and undergo fatty degeneration. The cartilages of the joint either become coated by the fungous extuberations and degenerate into the same, or they quickly deliquesce through the abnormal contents of the cavity of the joint, and disintegrate to a pulpy, fatty mass. At a further stage of the disease, the bones are likewise invaded, and, in fact, in the majority of these cases, become carious, so that in the end this form of inflammation may display the greatest similarities to the former. In both we not infrequently have the opportunity of observing in the vicinity of the joint, either in the osseous or in the soft parts, new-formed bone-substance, in the shape of irregular projections, small spiculæ, and the like.

In rarer instances the inflammation issues simultaneously from the bone *and* synovial membrane; here, however, such abundant exuberating granulations do not form so readily from the latter; a very rapid suppuration in the cavity of the joint takes place instead. For the rest, the relative condition of the soft parts, etc., is the same.

The fungous inflammation is principally observed on the knee-joint.

Symptoms.—Scrofulous inflammation of the joints may appear as an acute, even very acute affection, and terminate as such, or subsequently pass over into the chronic state; the beginning, however, may also be chronic, and remain so, or change to the acute form. In the latter case, when no febrile movements, due to other remote scrofulous manifestations, happen to exist, chills, alternating with sensations of heat, loss of appetite, and great restlessness, supervene, along with which symptoms, pains in the affected joint and in its vicinity, not infrequently extended for a considerable distance, manifest themselves, either immediately or in a short time thereafter. At first, they are mostly intercurring, dull, and aggravated on pressure and motion; soon, however, they become constant and intense, and sometimes become so excessively severe, when an attempt is made to move the affected joint, that the patient will cry out loudly. This is also adequate to explain the marked tendency of the joint to assume a certain position, and, indeed, such a one as will bring about the utmost possible equipoise, and cause as little tension as possible to the ligaments and muscles lying over the joint, because the traction thus obviated from the affected part serves best of all to make the pains bearable. Thus, for example, in coxitis the thigh is brought into a state of flexion, adducted and rotated inward to a moderate degree;

in the inflamed elbow-joint the forearm is placed midway between pronation and supination. Swelling of the joint, as a rule, soon becomes noticeable,* which is either limited to it, or extended for some distance beyond, and is of a round, spindle form, irregular in shape and size, and soft and doughy, or hard, tense, and firm, and only later on exhibits the signs of softening and fluctuation.

The skin is sometimes reddened, tense, and permeated by small and large vessels (particularly venous inosculations), is increased in temperature; or it may present no change of color, may be raised into smaller or larger folds, and be devoid of any perceptibly great amount of warmth. As the matter produced from the inflammatory product in the deeper structures and about the joints approaches the upper surface, the skin becomes red, not infrequently bluish, and the epidermis rises up like a blister. After a spontaneous or artificial opening has ensued, the pains subside for some time, as a rule, and the patient feels much relieved, but they invariably soon return, although not always in so severe a degree as before. In the further effects, the morbid picture assumes a different shape, according as to whether the disease runs through an acute course or approaches more to a chronic one. In the first case, death, as a rule, ensues some time after the breaking of the abscess, under pyæmic phenomena or consumptive fever; in the second case, the malady may last for a long time, and death, at some future period, occur through exhaustion, or from a new accession of the inflammation, or the process may assume a favorable turn, and result in one of the remote terminations to be mentioned.

The *chronic* form of the inflammation mostly begins with a moderate fever; the pain, as a rule, is also slight at first, and is only aggravated by prolonged exercise or by severe pressure on the joint, or the patient suffers somewhat more from them in chilly and wet weather. In this manner the process may go on for a long period before suppuration and bursting occur, by which the conditions undergo a change, according as to whether a diffused inflammation sets in, or the disease retains its chronic character. If the former happens to be the case, all the symptoms of an acute inflammation of the joint with a rapid and severe course may then supervene. In addition to the unfavorable terminations described, the joint-inflammations, especially when they are treated in the proper manner, generally and locally, may present the following results:

(1.) Recovery without any decided derangement of the function of the joint. This termination presupposes that the disease had not attained to a too serious degree, and that the cartilages and ligaments of the joint had suffered no extensive destruction. But, since these favorable preconditions are the attributes of the fewest cases, this termination belongs, therefore, to the greatest of rarities.

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* This, in fact, is often observed before the pain or any other symptom.—TR.

(2.) Recovery, with diminution of the function of the joint, owing to the inflammatory process having brought about such morbid alterations that a perfect restoration is no longer possible. In such cases, when the osseous and cartilaginous parts have suffered in a comparatively less degree, but the capsule, the ligaments of the joint, and the surrounding soft parts, on the contrary, have experienced a great deal of destruction, and the healing has progressed with contractions, adhesions, and fusions, it results in stiffness, with impaired mobility of the joint (false anchylosis), or, when the osseous parts and cartilages have also been more seriously affected, and, by the formation of new bone during healing, become uniformly united, true anchylosis may ensue. The latter result is also subject to a number of operative procedures—as healing with at least some mobility is more advantageous for some cases, and is sought to be accomplished by surgeons through an operation. False anchylosis, in the just-mentioned views, not infrequently furnishes a cause for operative undertakings, while true anchylosis, on the other hand, when it is combined with more marked deformity, becomes the subject of a manual treatment.

(3.) Healing, with luxation of the bones forming the joint; in the course of the inflammation after the tendons and ligaments have been destroyed, as also after perforation of the capsule has occurred, luxation of one or more bones from their natural position will result through any, in most cases trifling, causes (luxatio spontanea). When such a dislocation has existed for some time, it seldom becomes a promising object for surgical interference; only now and then, in inflammations which have already expired, and when the dislocation has not existed for a very long time, can a successful result be looked for from a surgical operation.

Therapeutics.—The treatment resolves itself into two parts: (1), in a general one, directed against the fundamental disease; and (2), in the topical against the local affection.

In regard to the latter, a perfectly quiet and proper position of the diseased part is of the greatest importance, and the *first* consideration of every treatment, if it is to be crowned with success. It has already been remarked that the patient will instinctively select a certain posture for the limb; but, since this position of the affected joint will generally be permanent throughout the entire course of the inflammation, and in some cases will prove unfavorable to the future exercise of the limb, it is therefore necessary to pay especial attention that the position is such a one that, at the termination in anchylosis, the usefulness of the limb will not be impaired in a too high degree. The patient, as a rule, soon becomes accustomed to the direction given to the limb, although it is just the contrary to the one he had himself selected.

Uninterrupted rest is to be maintained so long as there is any sign of inflammation, and only after it has entirely terminated can any movements of the limb, even with the utmost possible care and protection, be allowed.

The pains are best allayed by the internal use of narcotics, as also the local application of ointments containing morphine, etc.; but, if they have become very intense, then we should *not* hesitate to use cold, or even to apply ice.

Many remedies have been recommended as resolvents, to facilitate the absorption of the exudation. Those most frequently used are the preparations of iodine—iodide of potassium ointment; Richter's solution of iodine for pencilling the part—iod. pur., kali hydroiod., āā ʒ j, glycerine ʒ ij. The use of mercurial preparation requires much caution.

Jobert has lately recommended nitrate of silver as an excellent remedy in chronic inflammations of the joints. At first an ointment containing argent. nitr. ʒ j to adipis ℥ j, of which from ʒ ss to ʒ j is rubbed in twice daily; it is gradually made stronger, until it contains ʒ iij of nitrate of silver to ℥ j of fat. Setons, issues, moxas, and the actual cautery, have been used as derivatives; the latter, especially, has acquired a great reputation in *Rust's* hands. Nevertheless, the result falls far short of the expectations that have been entertained.

Numerous baths are also employed for the treatment of the cachexia as well as for the local affection; but these are only permissible with the understanding that the change of posture and movements will not cause the patient more harm than good. Iodine and bromine baths have acquired a certain amount of reputation; baths, with common cooking salt, deserve especial recommendation on account of their simplicity and cheapness. *Priesnitz's* method of treating joint-affections may be added here, which, in its entire extent over the whole body, should be discarded on account of the small amount of strength the child has to spare in the exhausting cure; but, locally to the affected joint, it deserves full consideration. Where suppuration exists, care should be taken to allow the pus to escape freely; the sinuses are to be dressed with simple, unirritating applications. Abscesses developing themselves in the vicinity of a joint, and bulging up under the integument, are to be opened as early as possible; on the other hand, the opening of abscesses which are in connection with the joints, or, after having perforated the capsule of the joint, subsequently reach beneath the skin, should be delayed as long as possible, if the strength of the patient is sinking and giving out, for then the process, as a rule, runs faster toward a fatal termination.

When purulent degeneration of the joint ensues, and there is no longer any hope, from the most appropriate local and general treatment, that anchylosis will take place, and the circumstances become aggravated to such a degree that hectic consumption is apprehended, then surgical interference comes into consideration as a *dernier ressort* of saving the life of the patient, provided the general condition—upon which, of course, every individual case must be judged separately—allows an operation to be undertaken. In these cases there may be a question about the removal of the affected part of the bone—resection—or about amputation of the limb, or exarticulation.

In joint-inflammations that have become totally chronic, the use of a graduated bandage upon the affected limb, with or without the simultaneous employment of remedies to accelerate absorption, particularly the preparations of iodine, will be found to be of great benefit. Compression may be effected with flannel or ordinary bandages, or a plaster of paris or starch bandage is applied around the joint for this purpose, by which it is also kept in the desired position. Sinuses and ulcers about the joint do not serve as contraindications. All that is necessary in that case is to cut out holes in the apparatus corresponding to the size and position of the ulcers, and to remove the whole dressing somewhat oftener than when the skin is whole. If the anchylosis, so far as it hinders the use of the affected limb in a marked degree, affords causation for treatment, then, according to the nature of that condition, simple or serious operations will have to be resorted to. To the first belong local and general baths, douches, fomentation, supported by passive movements, apparatus, and instruments; to the latter, the forcible breaking up of the adhesions and extensions, either by the aid of machinery or under anæsthetics, according to *Langenbeck's* precepts. Subcutaneous section of thickened aponeurotics, ligamentous structures, etc., may be previously performed to facilitate the operation. In bony anchylosis, resection of various-shaped pieces of bone may be resorted to.

SCROFULOUS INFLAMMATION OF THE HIP-JOINT (*Coxitis Scrofulosa*, *Coxarthrocace*, *Coxalgia*, *Morbus Coxarum*, *Luxatio Spontanea*, *Freiwilliges Hinken*, *Hip Disease*).—This disease occurs by far the most frequently of all inflammations of joints, and attacks scrofulous children in various ages of life, very often at the time of the second dentition. It generally takes its rise from the bony parts of the joint—most frequently from the head of the femur—less so from the synovial membrane, or the surrounding soft parts. It presents varieties in its stages, according as the course has an acute or chronic character. In the acute inflammation, violent pains quickly come on in the hip-joint and its neighborhood, which spread predominantly upon the inner side of the thigh down to the knee, and become aggravated upon pressing the hip-joint, or on attempts at walking. The latter are therefore carefully avoided; the thigh is drawn up against the abdomen, and rotated slightly inward. The pains usually increase in severity at night, and often rob the patients completely of sleep; conjointly with it, as a rule, active febrile movements are present, which often reduce the strength remarkably rapidly. It is extremely difficult for them to stand or walk, sometimes altogether impossible; the child throws the weight of the entire body upon the sound limb, draws up the affected side of the pelvis, and is in danger of falling. The region of the hip-joint, particularly the buttock, appears more or less swollen, the fold is generally longer and less marked than on the other side. Both extremities are either equally long, or the diseased extremity *appears* somewhat shortened or elongated. When the inflammation does not undergo resolution—the rarer case—it will pass over into suppuration attended by the most serious aggravations of the general and local phenomena; abscesses then form, either in close proximity to the hip-joint, or at some distance from it, communicate with the purulent accumulations in the joint, finally break open after reddening the integument, and are the causes of keeping up an intense suppuration and purulent infiltration. In cases where the destruction of the osseous parts goes on rapidly, the head of the bone becomes smaller and the acetabulum larger, thus giving rise to a disproportion of spaces, and, as a result thereof, we will have dislocation of the head of the thigh-bone, and an actual change of its relative position in comparison with its fellow. Soon after the bursting of the capsule of the joint, the fever assumes a hectic character, the strength of the system sinks, the patients become notably emaciated, and the muscles of the hip and thigh weak and soft. They often succumb at this stage to the continuous consumptive fever, which may also be accompanied by pyæmic phenomena, as the entire process may be of but very short duration. Only in rare instances does the suppuration ever grow less; in such cases, small pieces of bone may exfoliate and be expelled, and the orifices of the abscesses then close up.

In the chronic course of hip-joint disease, close observation will often show that the child, on walking, drags or draws one extremity; it complains of slight fatigue or weakness of the limb; the walk, when active, becomes unsteady, during which, likewise, the greater part of the weight of the body rests upon the sound side of the pelvis and extremity. The pains are not intense nor continuous, vaguely course about the thigh, and are rheumatic in character;

not infrequently, they are present in the morning, disappear during the day, and reappear in the evening, accompanied by febrile excitement. Very little that is abnormal may be observed about the hip-joint. Still, if the patient is told to raise up the affected extremity, a slight rotatory movement of the thigh inward, along with a small degree of abduction, will be noticeable. These circumstances, in the insidious course of the evil, may last for months (even years), and alternate also, frequently, with improvement and aggravation.

After a certain period the morbid picture changes without any apparent decided external cause, and inclines more and more toward the acute form. The well-known pains in the knee come on, which are very intense in most cases, without, however, becoming aggravated on touch or pressure. These pains are explained by the supposition that the external cutaneous branches of the obturator, or of the internal saphena nerve, are irritated. The walk becomes still more difficult, the patient limps, the toes only touch the ground, while the weight of the body comes to rest upon the extended sound limb. In the sitting posture the buttock only of the sound side rests upon the seat, and, when the patient desires to pick up some object from the floor, he only bends the sound knee, while the diseased extremity is kept stiff and extended.

At a further stage of the disease certain symptoms supervene, which have given rise to the most varying views and significations, and which have already been alluded to above, namely, an elongation or shortening of the affected thigh in comparison with its fellow, without any change in the position of the bones, entering into the formation of the joint, having taken place. Formerly it was almost wholly assumed that the head of the femur was pressed out of the acetabulum by the exudation, and displacement of the femur thus produced, or it was drawn into the acetabulum by strong muscular contractions, and the extremity shortened. All evidences, however, tend to show that the supposed shortening or elongation is no actual condition but only an *apparent* one, produced by the sinking of the pelvic moiety on the diseased side, or through displacement upward of the pelvis on the affected side, with subsequently resulting curvature of the spinal column. For the purpose of clearly elucidating this circumstance, and to avoid falling into a very possible error, certain accurate measurements are to be instituted; but first it is necessary to bring both anterior superior spinous processes into the most direct line possible, the patient being on his back, and a rectangular line drawn from the xiphoid cartilage of the sternum, directly to its centre. Then both extremities should be placed in perfectly exact positions, and both sides measured from the spinous processes to the internal condyle and internal malleolus.

At this stage, i. e., while the deformity is only apparent, the disease may also be brought to a stand-still and cure, and the phenomena of shortening or lengthening disappear, provided no alteration in the configuration of the pelvis and spinal column has taken place, sufficient to prevent the pelvis from regaining the straight position.

But, on the other hand, if the disease goes on unchecked, a more or less marked swelling of the fundament and region of the hip-joint takes place, the integument becomes red and soft, fluctuation is distinctly felt, and these conditions are soon followed by the breaking of the abscess. This, however, does not always take place in the neighborhood of the joint, the pus may tunnel its way downward, and make its appearance in the region of the knee, or even still lower down. It may also perforate the capsule of the joint. In the majority of cases, this occurs at its posterior or under side, where on the one hand it is less dense, and on the other, also, the greatest amount of pressure is exerted by the head of the femur, especially when the patient is left to himself to select his own position. Pus may sometimes be observed escaping from the cavity of the joint through the communicating place, with the bursa beneath the iliacus internus and psoas magnus muscle, into the latter, and thence into the pelvic cavity; in addition it may also run into the pelvic space by perforating the ilium along the gluteal group of muscles. The sinous openings, left after the bursting of the abscesses externally, are generally surrounded by spongy, readily-bleeding granulations, which project above the level of the skin; extensive ulcers, also, not unfrequently form upon the skin and subcutaneous cellular tissue at the places corresponding to the perforations.

In progressive destruction of the osseous substance of the bones, entering into the formation of the joint, there originates a shortening of the neck of the femur, and an enlargement of the acetabular space, thus resulting in a disproportion, which is the fundamental condition to the process called luxatio spontanea, and is attended by true shortening or elongation of the thigh, in comparison to its fellow. In the advanced carious process, dislocation of the head of the femur or the residue thereof very frequently occurs by the mere altering of the position in bed, by raising the patient, or by the energetic contractions of the extensor muscles, and may be effected in different directions. Most frequently, however, the luxation takes place upward and backward upon the dorsum ilii, because the head, by the position of the thigh, comes to press mostly against the posterior border of the cotyloid cavity, and its carious destruction is completed at an earlier period, and the head of the bone then has but a very slight impediment to overcome. When that portion of the ilium, upon which the ulcerating caput femoris comes to rest, is also attacked by carious disease, perforation of the ilium, with penetration of the head into the pelvic cavity, may take place, although this event may also happen, without dislocation, by perforation of the floor of the acetabulum.

Besides the usual form of dislocation of the head of the thigh-bone, it may also occur into the ischiatic notch, obturator foramen, or upon the horizontal ramus of the pelvis; these are, however, very rare and exceptional instances. Total exfoliation of the head of the bone, and its expulsion through a large sinus, have also happened in the experience of some surgeons; in favorable cases a cure may take place after these processes, not, however, without very great deformity.

When an arrest in the progress of the disease, and recovery from the evils under consideration after luxation, have taken place, the just-described effects will remain behind and impair the usefulness of the limb in a high degree. In fortunate cases a kind of joint-cavity forms at a future period near the old one, in which the head is able to perform some evolutions, but in most it is held firmly in its new place by adhesions and newly-formed structures.

Most frequently, however, the dislocation of the head of the femur is the precursor of the last stages of the disease. The suppuration constantly becomes more and more profuse, not infrequently large portions of the integument slough off, and the extremity, in consequence of pressure on the veins or obstructions within them, becomes œdematous. The fever assumes more and more the hectic character; shiverings or actual chills come on, and the patients die exhibiting the picture of general consumption.

In the acute form of inflammation of the hip-joint, as also in the fully-developed disease, there will be no difficulty whatever in forming the true diagnosis; in the chronic course, on the contrary, it may, in its incipient stages, be entirely overlooked or confounded with other processes. At the commencement of the disease it is not unlikely to be mistaken for rheumatic affections, or for coxalgia, still an accurate observation of the delineated symptoms, and the absence of phenomena peculiar to those diseases will plainly point out the true diagnosis, although the general state of the system had not yet directed any special attention to the local trouble.

Therapeutics.—The most important part in the treatment of coxitis is absolute rest of the lower extremity and hip-joint, and this indication is to be carried out *with the limb in the extended* position. For this purpose the same apparatus is advantageously resorted to as is used in fractures of the neck and body of the femur, and preferably with double splints for the outer sides of both extremities, which should reach up to the axillæ, and be united below by a foot-board, while the pelvis is secured to the apparatus by a strap or girdle. No matter how much the patients are opposed to this apparatus at first, especially if they have been allowed to retain the thigh in the flexed and adducted position which they had themselves selected, they will readily become accustomed to it, especially if, at first, it is only applied for a while and gradually kept on for a longer time.

Starch and plaster-of-paris bandages have also been used with advantage for the purpose of keeping the limb and hip-joint immovable: these may especially be used in the milder cases, for in these the displacement of the pelvis does not require so great a counteracting power as in the severer.*

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* A variety of apparatus has been invented for the purpose of securing complete immobility to the affected hip-joint. M. Bonnet's *grand appareil*, and Bauer's wire-breeches—which is a modification of the first—are so constructed as to fit to the pelvis, both thighs, legs, down to the feet. The apparatus being well fitted and padded, is secured to the parts by bandages and leather straps, thus securing perfect immobility for the lower half of the person. Barwell, of London, however, finds fault with this appliance, on account of its interfering with the movements of the sound limb and spinal column, without securing perfect immobility to the diseased hip-joint, and has had a splint constructed which simply restrains the movements of the affected limb. It consists of a pelvic portion made of wire gauze and reaching from the spine of one ilium to the other, thus embracing both sides of the pelvis and the sacrum, wide enough to reach from the crista ilii to the trochanter on the sound side, and extending from the pelvic band on the diseased side down the outer aspect of the thigh as far as the knee. The instrument is also secured to the trunk by an india-rubber band surrounding the body. It should be well lined and padded, and retained in place by bandages and adhesive plaster. As regards the use of counter-irritants, there is great diversity of opinion. No doubt seems to exist as to their usefulness in the early stages. Thus, in subacute synovitis of the hip-joint, blistering and the use of savine ointment will suffice, but, when the severe symptoms of ostitis show themselves, the more potent cautery or caustics are required. Potassa fusa is frequently resorted to, but at this stage is properly superseded by the potential cautery. The splint should not be removed until some period of time has elapsed after the subsidence of all symptoms of inflammatory action, and after its removal the patient should remain in bed for a few days, and gradually undertake the exercising of the limb.

At a further stage of the disease, when lengthening, with abduction and flexion, has existed for some time, the patient will suffer intensely from a very peculiar and painful clonic spasm of the muscles of the thigh, aggravated at night, depriving him of all sleep, and indirectly undermining the health. Narcotics, even in very large doses, have little if any quieting effect, so that, generally, it is better to place the limb in a straight position and retain it by counter-extension, a measure easily accomplished, as the pain is chiefly due to spasmodic muscular contraction, caused by nervous irritation, and is overcome by the extension. If the deformity is slight, and the

Lately, resection of the femur has also been successfully performed. The operation is comparatively easy, as, the ligaments and capsule of the joint having been almost wholly destroyed by the various processes, one long incision will suffice to reach the head of the bone; it is then turned out of the socket and sawed off by the ordinary or chain saw. Other methods of operation are based upon the substitution of a triangular or an elliptical incision for the straight one, but in that respect no positive rules can be laid down, for the sinuses, which are invariably present, will materially affect the direction that is to be given to the flap.

Where a cure has resulted with dislocation of the head of the bone, the deformity and hinderance in the use of the limb may be sought to be remedied by surgical operations. Where the dislocation is but of short duration, the usefulness and direction of the limb may, in a measure, be improved by an operation best adapted to the individual case, and afterward bettered still more by a properly-adjusted instrument.

SCROFULOUS INFLAMMATION OF THE KNEE-JOINT (*Gonarthrocace*, *Gonalgia*, *Tumor Albus Genu*—*White-swelling of the Knee*).—This disease takes its starting-point either from the bony parts of the joint, and preferably from the condyles of the femur, less frequently the head of the tibia or—but, in fact, oftenest—from the synovial membrane, with or without the ligaments of the joint. The phenomena vary according as to whether the disease occurs in an acute or chronic form; in the former case they may manifest themselves in an intensely-rapid and violent manner, and in a short time terminate in suppuration of the joint, or even fatally—in the latter, the signs are often at first very slight, almost unnoticeable, and only after a while become aggravated.

Symptoms.—The affection begins with a sensation of stiffness and some impaired mobility of the joint; flexion is difficult, while extension, on the contrary, is generally hindered to a less degree. Swelling of the joint, which may be proved by comparative measurements, is early recognized by the depressions to both sides of the ligamentum patella, as also by the knee-joint appearing fuller and larger. The

case be in its primary stage, the splint alone may be sufficient to overcome the contraction, while in aggravated cases tenotomy may be required.

Should fluctuation be discovered in the joint, Bauer, Barwell, and others, recommend evacuation of the pus, either by opening the capsule with a tenotome, allowing its exit into surrounding tissues, or the use of a trocar and canula. The latter measure seems preferable, inasmuch as by it the fluid may be seen and examined, and the diagnosis confirmed as well as the treatment aided. Finally, in the third stage of the disease, where there is great deformity from strong and rigid contractions which cannot be overcome by counter-extension, etc., aided by chloroform, and there is intense suffering from muscular spasms, tenotomy must be resorted to, after which the limb, being placed in position, may be retained so by means of the hip-joint splint. For further details, the student is referred to the standard works on surgery.—TR.

temperature of the part is usually somewhat increased. As the disease progresses, the leg gradually becomes contracted upon the thigh, and the movements more painful, especially flexure of the limb. The pains soon become constant, even without any attempts at motion. At first they are of a dull character, after a while become more intense and sharper, and extend down to the foot, the tumefaction increases, generally has a peculiarly-elastic feel, but does not fluctuate; the integument retains its color, and is mostly intense and shining. When suppuration begins within the cavity of the joint, and the abscesses rapidly increase in size, the integument becomes red, and distinct fluctuation is felt, more or less plainly, in the degree in which the pus reaches the skin; the pains become so aggravating as to rob the patient completely of all rest and comfort. The abscesses burst either in the circumference of the joint, or the pus sinks downward along the leg, and in some cases makes its appearance in the region of the ankle. In addition, abscesses have been observed to break on all parts of the leg, most frequently on its anterior surface. The pus, facilitated by the position of the extremity, has also been seen to travel for a distance upward upon the thigh, and to make its appearance there. When the process is attended by carious destruction of the bones entering into the formation of the joint, and ulceration of the capsule and the contiguous soft parts, dislocation of the bones may likewise ensue in this condition, and this may happen especially to the tibia, which will present a partial or total luxation from its natural position.

The process may come to a stand-still, at every stage of the stated alteration in the course of the disease, in which, according to the extent of the pathological alterations, more or less impairment of motion, and of the configuration of the joint, will ensue. In most instances there results—when the treatment did not prevent this termination—a cure, *with union of the joint ends*—anchylosis: in more favorable cases, where the treatment was more successful, the result will be the formation of fibrinous and ligamentous bands, following inflammations which took their issue from the synovial membrane, and were unattended by any serious destruction of the cartilages—false anchylosis: in the unfavorable, complete bony union of all the bones of the joint following carious inflammation of the bones, with exfoliation of the cartilages—true anchylosis.

If the disease goes on without displaying any tendency to abate, and enters its last stages, the leg will become œdematous, suppuration will be profuse, the general phenomena assume a more and more alarming character, and death ensue either from exhaustion or purulent infection.

Therapeutics.—The principles already laid down in the treatment of inflammation of the hip-joint are also applicable here. Of the serious surgical operations, amputation of the thigh will claim the main consideration; resection of the knee-joint will hardly ever be practicable, on account of the extensive osseous surfaces, which will have again to undergo suppuration, and the small prospect of recovery which will attend this operation.

Scrofulous Inflammation of the Ankle-Joint (*Tumor Albus Articuli Pedis. Podarthrocace*).—This disease, which is of tolerably frequent occurrence, usually commences by a very moderate, and after a while a more intense, growing, fixed pain either on the anterior surface of the ankle-joint or on one of the lateral regions, seldom embracing the entire joint. Motion, at first, is but little hindered; soon, however, it becomes so difficult that the foot is dragged along, the patient being unable to bring it down flat upon the floor, and every false step, every collision with firm objects, even the stepping upon firm bodies, stones, etc., induces a painful sensation of the joint. An elastic swelling, covered by normal-colored skin, soon manifests itself about the ankle-joint, by which the spaces beneath the malleoli become filled out, and the entire region of the joint more voluminous. The pain is constant, of a dull or tearing character, and radiates over the foot.

At a further stage of the malady the skin becomes reddened and the swelling softer, fluctuation is detected at one or more places, in consequence of the purulent accumulation either direct from the ankle-joint or from an abscess that has originated in its vicinity, and which soon communicates with the cavity of the joint. The pains attain to their acme before the abscess breaks; when that has occurred, they decline in intensity. Through the fistulous openings, of which quite a number are sometimes seen about the joint, the opened cavity of the joint may readily be reached with a probe, or the probe may encounter carious portions of bone belonging to the tibia or tarsal bones, while from it a very badly-smelling discolored pus, which is also mixed with crumbly granular pieces of tubercular masses and particles of bone, escapes. The fistulous openings are indebted for their origin to abscesses that have formed in the soft parts around the joint, and which, in most instances, will be found to penetrate clear into the diseased cavity of the joint.

At a further stage, if the disease has gone on unchecked, the foot becomes misshapen and deformed, for its anterior part generally emaciates, the region of the joint thereby appears disproportionately enlarged, and, in addition, is drawn upward in consequence of contraction of the tendo Achillis, after the manner of talipes equinus. The disease, as a rule, runs a very slow course, with acute and subacute exacerbations; sometimes heals with deformity and permanent impairment of motion, but, under serious disturbances of the general system, from profuse suppuration and exhaustion, may also terminate fatally.

Therapeutics.—Besides amputation of the leg, which, in this form, may come into consideration, it may also be a question about exsecting the carious ankle-joint, if the disease has only involved the lower joint-end of the tibia, and the upper surface of the astragalus.

SCROFULOUS INFLAMMATION OF THE ELBOW-JOINT (*Olenarthrocace*).—In strumous subjects, the elbow-joint is not infrequently the site of inflammation, which generally has its starting-point in the synovial membrane, and attacks the bony joint-ends; sometimes, again, it first starts from the spongy portion of the bones entering into the formation of the joint. The disease, as a rule, begins with a slight degree of difficulty in exercising the joint, and with mild pains; both phenomena gradually become aggravated, while round about the joint a swelling forms, which at first is tolerably dense and elastic, but, after a while, becomes soft and breaks open at one or more places.

The forearm is bent more or less upon the upper arm, and has a position midway between pronation and supination; the whole extremity not infrequently presents a peculiar appearance, for the forearm is atrophic, the upper arm also, on account of its inactivity, suffers its muscles to become emaciated, while the region of the joint is seen to be swollen into a spindle or globular form. The destruction within the joint, as a rule, may be easily ascertained by the examination with the probe through the sinuses, as these, in most instances, do not form any very long tracts, but lead directly to the bone.

The general phenomena vary in the manner often already described, according as to whether the course has an acute or chronic character; hectic and pyæmic fever less frequently become developed from this kind of scrofulous inflammations than from those previously described, but, nevertheless, do likewise occur. When the disease goes on toward recovery, a cure may take place, with more or less deformity and anchylosis. Dislocations of some of the bones from their normal position do not often occur, even in extensive destruction. Most frequently, a luxation of the ulna backward, or a displacement of the head of the radius inward, takes place.

Therapeutics.—Besides amputation of the upper arm, which may come into consideration in very violent inflammations of the elbow-joint endangering life, resection of the carious bones is yet to be mentioned, which is not infrequently resorted to in exhaustive suppuration, to save the life of the patient, or to shorten the morbid process in the joint. Generally a longitudinal incision, running parallel with the inner border of the olecranon, commencing two fingers' width above it, and running downward, will be sufficient for the removal of the diseased bones; where this does not answer, a complicated incision, the shape of which depends mostly upon the existence of the sinuses, will be necessary. In all methods of operation, proper care should be taken to preserve the ulnar nerve.

GENERAL TREATMENT OF TUBERCULOSIS AND SCROFULA.—In the great importance which, according to my views, is to be attached to the hereditary disposition, as the chief cause, there can be less of a question of preventing the outbreak of the cachexia, than of attaining a possibly mild, favorable course of the various local manifestations.

Scrupulous avoidance of all digestive disturbances, and residence in well-ventilated rooms, are the two chief points upon which the physician has to insist, in children the progeny of tuberculous parents.

They should remain for a long time at the breast of a healthy wet-nurse, and be weaned with the utmost caution. Subsequently, all nutriments which produce flatulence are to be avoided. The chief articles of diet in the first ten years should be milk and milk soups, beef broths and juicy meat, tender vegetables, and plenty of ripe fruit. Potatoes should not be allowed in large quantities; the bread should be well baked. Children should get nothing but water for a drink. Small quantities of beer can do no harm; wine and other spirituous liquors, however, should be strictly prohibited.

Acorn coffee is especially adapted as a drink at breakfast, and pure milk is to be substituted for it when the patients are no longer disposed to take it readily; genuine coffee should not be used under any circumstances.

No departure need be made from this diet, so long as the strumous affections, which happen to supervene, are feverless; when febrile excitement comes on, the instinct, which in children is even keener than in the adult, will forbid it of itself.

As regards the residence, a sunny sleeping and sitting-room, as large as possible, and capable of being thoroughly ventilated, is to be urgently recommended. In summer the children should be out the entire day in the fresh air; in winter, at least two hours every-day. Frequent tepid-warm, and, still better, cold baths and ablutions are the best means of protecting the children against colds, and the so-frequent bronchial catarrhs. Sea-baths and salt-water spring baths are also of especial benefit to scrofulous children.

In summer they should live in the country; in winter, in large, spacious apartments. The residence in warm climates during the cold seasons of the year has, it is true, the great advantage that the children are there able to be much more out in the fresh air. But since this change of place has to be carried out every year, if, in the succeeding years, the children are not to be subjected to the danger of suffering decided harm, they thereby become accustomed from their earliest youth on to an unsettled, roving life, and regard themselves as eternal patients. That there is no happy prospect in store for such hot-house plants needs scarcely any additional assurance.

Of the remedial agents, cod-liver oil without doubt deserves the first name on the list. It is contraindicated in febrile conditions, in anorexia, and in diarrhœa; the latter condition it is of itself apt to induce in the hot summer season. Aside from that, it is taken with the greatest advantage for years by all scrofulous, and also well-pronounced tuberculous children.

It is best to give it one or two hours after breakfast, in quantities of from one-half to one tablespoonful—a little coffee or a small piece of sugar is given afterward. On the whole, most children do not require to be remunerated at all with any particular delicacies for taking the oil, for usually it is not repulsive to them in the least, and they will themselves remind the nurse to give it to them if she has once forgotten to do so. It is well to inform the relations, at the very outset of the cure, that an improvement can only be derived from years' constant use of the remedy, and that it has to be given for many months, even though at first no change or no aggravation should have taken place.

In well-nourished, but, for the most part, strongly-tainted, scrofulous children, small doses of tincture of iodine, one or two drops, to the ounce of the oil, may be added. Still, I would never advise a long-continued, internal treatment with iodine. Springs containing iodine and bromine, of which Heilbronner stands at the head of the list, next Kreuznach, are of decided benefit in scrofulous children free from bronchitis, but totally contraindicated in emaciated children with suspicious bronchitis.

If the cod-liver oil is not tolerated, or the child refuses to take it, some substitute must be looked for which will take its place. A tea made from walnut-leaves seems to be the most advantageous, and of which two or three cupfuls should be given daily. A decoction of hops, or a calamus infusion, is also relished by some children, but many others refuse to take either on account of the intense bitterness. To children with excessively-pale lips and mucous membrane, mineral waters containing iron, or easily-assimilated preparations of iron, for example, ℞ martis pomat.,* must be given.

All exhausting treatment, whether it consists in abstraction of blood or emetics, in purgatives, in antimonials or mercurials, induces, in all cases, an aggravation of the dyscrasia, and is therefore to be entirely avoided.

* Malate of iron.—Tr.

Unfortunate, finally, are the effects which result from surgical operations on scrofulous bones. The same diseases of the bones, for which the operation was undertaken, usually spring up anew on the wounds of the bones, and the process is but little retarded, in spite of all the torture and pains.

(3.) HEREDITARY SYPHILIS.—Syphilitic parents beget children, who are either born with the signs of the malady, or, at least, present them in the first few months of life. Prognostically, it is of importance to distinguish whether the children bring with them the developed syphilis into the world, or only become affected with it some time thereafter.

Children, in whom syphilis has broken out *in utero*, are mostly delivered prematurely and dead, and surely perish soon after delivery if they came into the world with pemphigus vesicles. But the progeny of syphilitic parents, born apparently healthy, who only manifest signs of inherited syphilis after many weeks or months, very frequently recover under an appropriate treatment, and may develop perfectly, without any further cachectic troubles.

Before we enter more minutely into the etiological question, it may prove advantageous to first analyze the morbid alterations belonging to syphilis.

Symptoms.—Inherited syphilis manifests itself: (1), upon the skin; (2), upon the mucous membranes; (3), in the subcutaneous cellular tissue; (4), in the muscles and bones; and (5), in the internal glandular organs.

(ad 1.) *Skin.*—Syphilitic eruptions of the skin (the syphilides) are divided into (1), *maculous* and *squamous;* (2), *papulous;* and (3), *pustulous* and *bullous.*

To the *first form*

Roseola syphilitica belongs. By this we understand small spots, of the size of lentils up to that of split peas, of a coppery color. They appear simultaneously upon large tracts of the surface of the body as bright-yellow or yellowish-red spots, primarily without any alteration of the epidermis of the affected parts, and without any induration or elevation over the parts of the integument that are still sound. In time, however, they become slightly elevated, the color turns to coppery, and they appear as if ground off, or, in other cases, become covered with fine white scales. If the patient is subjected to an antisyphilitic treatment, they will disappear entirely, but, if nothing is done, they will become more and more infiltrated, the epidermis either corrugated or dry, the crusts begin to exhale serum, and the spots covered with yellow scabs.

On parts of the integument that are constantly soiled with the alvine discharges, as on the nates, and the posterior surfaces of the thighs and extremities, excoriations often form, and finally, also, deep ecthyma-like ulcers.

Even the unaffected portions of the skin never preserve the normal color and smoothness. They exchange their rose-red color for a smoky-grayish one; this is strikingly seen on the face, and still more so on the forehead. The integument in many places becomes wrinkled, in consequence of the emaciation which invariably ensues in syphilis. The palms of the hands and soles of the feet seldom remain intact; a serious desquamation soon takes place upon them, and, in children who often handle the dirty sugar-teat, deep ulcers form on the palms of the hands. This preference of the syphilides for the last-mentioned parts of the integument is of great importance in the diagnosis, for the other non-syphilitic eruptions spare these very parts.

The *second form*, *papulous*, scarcely ever exists by itself, but is complicated either with the first or third form, bullous. Syphilitic papules (lichen or strophulus syphilitica) are of a brownish color and hard, without any red areola, in most instances dispersed, and are likewise oftenest found on the palms of the hands and soles of the feet. They are not characteristic enough to allow the diagnosis of syphilis to be based upon them alone without any additional symptoms. If no treatment is instituted, they will remain unaltered for a long time, grow more and more numerous, are destroyed in many places by scratching, and then represented by larger or smaller irregular ulcers. But, if a proper treatment is carried out, they will completely disappear in a short time; this is explained by the slight morbid derangement they had produced.

The *third form*, *bullous*, and *pustular*, is the most malignant, and occurs only in the very aggravated stages of the cachexia. It is represented by

PEMPHIGUS SYPHILITICA.—By this we understand yellow, yellowish-green, or brownish purulent blebs, of the size of a hempseed up to that of a bean, surrounded only by a narrow areola. Their contents are turbid, purulent, of an alkaline reaction. They occur mostly in an isolated form, coalesce only on very few places, and these are also most surely found upon the palms of the hands and soles of the feet. These pustules either collapse after several days, and dry up into thin crusts, or they burst, their contents escape, and an intensely-reddened cutis becomes visible after the epidermis has exfoliated. Afterward the sore discharges but very little, so that hardly any crusts form, and the garments are but little soiled. It is not possible for deep ulcerations to form, for the simple reason that the subjects do not live long enough for that purpose, but collapse rapidly, and perish, without any additional sickness, under weakness and exhaustion.

The prognosis, in this bullous exanthema, may be put down as fatal with the utmost certainty. Children who bring the developed pustules with them into the world die in the first few days after delivery; but, when they acquire them a little later, between the third and eighth day of life, they may live for a few weeks, but ultimately die almost unexceptionally. That form of congenital syphilis, which, according to *Zeissl's* extensive experience, almost entirely manifests itself in the form of pemphigus, is invariably fatal.

It is a remarkable fact that syphilis, in the great majority of these cases, descends from the father, and that the most careful examination of the mother leads to no positive results, so that the connection between these exanthemata and syphilis has often been doubted. The doubts have mainly arisen in lying-in-houses, where the affected fathers very naturally could seldom be seen, while, in private practice, the previous and present state of health of the father can readily be ascertained. In the latter case it becomes apparent that the father invariably suffers, or at least had suffered, from secondary syphilis. It has often been observed that, after the father had subjected himself to a thorough antisyphilitic treatment, the children then generated come into the world normal, without any sign of syphilis whatever, and subsequently also remained well.

Besides these pathognomonic pemphigus pustules, there is yet a pustular eruption which occurs at a later period in syphilitic children, but these pustules are situated upon a red, hard base, and, after they burst, leave behind deep lardaceous ulcers (ecthyma pustules).

The cutaneous ulcers and rhagades, which only break out after birth, are the most characteristic lesions of syphilis; they occur by special preference at the angles of the mouth, on the margins of the lips, and around the anus and genitals. The ulcers on the lips are flat, have a yellow, but slightly-indurated base, and are strictly confined at first to the red margin which hems the lip. Not till after some time do they grow beyond their original limits, and involve the adjacent integument, particularly the lower lip, where the epidermis is softened, by the food and sugar-teat.

By *rhagades*, cracks, fissures of the lips in the direction of the natural cutaneous folds, are understood. They sometimes originate in perfectly-healthy lips, generally, however, the ulcers just described are present, from the crusts of which the lips become brittle, and, when they are much stretched, as they necessarily must be every time the child cries, it causes them to crack and break. The little fissure is next infected by the pus from the ulcers, and tolerably deep, yellow erosions result, which bleed freely every time the lip is stretched, and for the same reason also heal extremely slowly.

The fissures are also met with at the nares, though less frequently than about the mouth, as also about the anus and vulva in girls, and occasionally also at the angles of the eye. Those of the lips have an additional particular importance, namely, by them a syphilitic nursling may most surely and directly infect a healthy wet-nurse.

Finally, as regards the cutaneous secretion, badly-smelling perspirations over the entire body, especially on the head, occasionally occur in syphilitic children. They also disappear as soon as the cachexia is eradicated from the system.

(ad 2.) *Mucous Membranes.*—Swelling of the *nasal mucous* membrane is the first manifestation of hereditary syphilis, and does not appear for some weeks after the delivery. Children thus affected breathe through the open mouth, and snore while nursing. No morbid alterations are to be observed on the external surfaces of the nose, but the mucous membrane appears reddened and tumefied. A purulent discharge, coryza syphilitica, sets in after this swelling has existed for several days, the pus at first is muculent, and subsequently becomes sanguinolent, ichorous, eroding the upper lip over which it flows down. The spreading serpiginous ulcers which soon form may finally attack the bone, and cause necrosis and exfoliation of the vomer, the turbinated, and the ethmoid bones. When the subjects surmount such an intense syphilis, the nose at least will be destroyed, and the face disfigured for life.

The same flat, shallow ulcers originate upon the *mucous membrane* of the mouth, and *upon the tongue*, as on the margins of the lips; they never penetrate deeply, and readily cicatrize, if a proper treatment has been instituted.

The fissures and ulcers about the anus, on the vulva and prepuce, have already been spoken of. Leucorrhœa and ulceration of the vagina occur tolerably often. Otorrhœa and ophthalmoblennorrhœa in syphilitic children differ only by their great intensity from the non-syphilitic. In this ophthalmoblennorrhœa both corneæ soften in the shortest time, and the process terminates extremely unfortunately, with phthisis bulbi.

(ad 3.) *Subcutaneous Cellular Tissue.*—In many syphilitic children small abscesses form in the subcutaneous cellular tissue, which have no connection with the lymphatic glands. Whether the abscesses are opened with the lancet, or whether they break spontaneously, the orifices, in all instances, become ulcerated, and cicatrize only after a long time, with intensely-colored puckerings. Ulceration of the nails (onychia) is very often observed on many fingers and toes at the same time. These processes are also very tedious, especially when the fingers come a great deal in contact with the sugar-teat; the new nail then becomes rough, uneven, and misshaped.

The lymphatic glands, in the neighborhood of syphilitic ulcers, do indeed swell up consecutively; they seldom, however, pass over into suppuration. In general it may be said that the lymphatic glandular apparatus of children is much less affected by syphilis than by scrofula and tuberculosis.

(ad 4.) *Muscles and Bones.*—In very severe syphilis, which develops itself several weeks after birth, paralysis of the upper, less frequently of the lower, extremities occurs. These paralyses do not always extend over an entire extremity, nor are they always complete, for often a slight capacity of exercising some of the muscular groups remains behind.

The bones participate in hereditary syphilis very rarely only. Congenital fragilitas ossium, in which all the tubular bones may be broken into fragments with the least amount of power, and which naturally is only met with in still-born, or in children dying soon after delivery, has been claimed to be connected with syphilis of the parents.

This process, on the whole, is extremely rare, and, in the cases so far observed, the existence of syphilis was not by any means demonstrated in a satisfactory manner.

Periostitis and necrosis of some portions of the bones, a very usual process in secondary syphilis of the adult, occurs but very seldom in hereditary syphilis of the new-born child.

(ad 5.) *Glandular Internal Organs.*—Abscesses in the thymus glands, which have already been treated on page 281, are very much doubted as to being syphilitic, for the physiological cavities, which form in the atrophy and absorption of this gland, can scarcely be differentiated from abscesses.

* In still-born children, the progeny of syphilitic parents, true abscesses are observed in the thymus gland in some rare instances; it is, however, necessary to guard against the possibility of mistaking the physiological cavities which contain a white fluid, and which occur in all children, for abscesses. The contents of the former always react acid, those of the latter, like pus, alkaline. In general, it should be observed that, in most children who die from hereditary syphilis, *no* purulent cavities of this kind can be found. I have already dissected at least a dozen such children, but only once found a cavity which

resembled more an abscess than a physiological cavern; the chemical test was unfortunately omitted. *Bednar* has also observed cystic formations in the thymus of syphilitic children. In some cases, he found cysts of the size of beans, filled with clear, yellowish fluid, and, in others, the whole lobes were converted into two large, yellow cysts.

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* This paragraph was accidentally omitted from the section which treats of the affections of the thymus gland, page 281.—Tr.

The morbid alterations of the liver have already been described on page 210. In the lungs, spleen, and kidneys, gummy tumors of a specific character have been found. Most of the children thus affected come into the world with a bullous eruption, and invariably die in a few days.

Course and Termination.—As soon as the first signs of hereditary syphilis have appeared, which commonly happens, with the exception of congenital pemphigus, in from one to six months after delivery, the child begins to lose flesh, becomes restless, and soon acquires the characteristic, smoky appearance of the skin. Children, who are about to be brought up by hand, succumb usually to anæmia, or to a supervening intestinal catarrh. Children at the breast, under a proper treatment, recover tolerably often. The later the syphilis comes on, the more favorable the prognosis; the earlier, the more unfavorable.

Etiology.—In the great majority of cases hereditary syphilis descends from the father, not from the mother. If the mother is afflicted with secondary syphilis, the pregnancy will hardly ever go on to its natural conclusion; an abortion, or, at least, a premature delivery, will take place. This, in fact, happens also, although less frequently, in secondary syphilis of the father; the pregnancy here usually terminates normally, but the child comes into the world either with pemphigus syphilitica, or manifests the above delineated signs of hereditary syphilis in the first six months of life.

When the father suffers from secondary syphilis, the mother may remain uncontaminated, and nevertheless give birth to a syphilitic child; conception and delivery of such children may even be repeated several times without the mother becoming infected in the least. This often-confirmed fact is all the more remarkable, as the fœtal blood communicates directly with the maternal, and the fœtus acquires syphilitic pemphigus *in utero.*

Secondary syphilis descends only from the mother when she becomes infected with primary before or during pregnancy, and subsequently manifests the secondary symptoms. When the mother only becomes primarily infected during the last three months of gestation, the offspring will remain uncontaminated. It seems very improbable that a healthy child could become infected from primary ulcers on the infection which it may come in contact during the act of delivery. The children are covered with a thick layer of vernix caseosa and have a sufficient loss of substance in any part of the body; in this case they would also have to have a primary sore before the secondary symptoms breaks out, a point to that is scarcely ever observed.

There is another remarkable fact, namely, that a child who has inherited its syphilis entirely from the father, the mother being sound, will never inoculate its own mother, while a healthy wet-nurse, who undertakes to suckle such a child, becomes infected as a rule. There results from this the therapeutically important precept that a syphilitic child may readily enough be allowed to be suckled by its own mother, but never by a wet-nurse, for the latter, in case she should happen to become infected, may justly hold the parents responsible.

The manner in which a syphilitic nursling infects a healthy wet-nurse is not always demonstrable. The simplest manner in which the inoculation may take place is by the ulcers on the lips of the infant coming in contact with a sore on the nipple of the breast of the wet-nurse. Occasionally it is observed that the breasts of the wet-nurse remain uninjured, and symptoms of constitutional syphilis come on notwithstanding. Conversely, it also happens that a syphilitic wet-nurse transmits syphilis upon a healthy child without the nipples of her breasts having been diseased. There is no necessity at all to resort to a transmission by the milk to explain these cases. Contact of the child with the mouth of the wet-nurse, or with her fingers, which shortly before had touched syphilitic parts, seems to be the more likely cause.

It is not absolutely the rule that a father who is affected with secondary syphilis should always beget syphilitic children. A considerable number of children remain free from all signs of infection, while the fathers are well known to be strongly tainted. The children of a father are least susceptible, whose syphilis is already very inveterate, has left the skin and mucous membranes, and has been localized as tertiary syphilis in the bones.

Treatment.—Mercury acts extremely quickly and beneficially in syphilis of small children, and in fact best when applied in an external manner. For a number of years past I have ceased giving mercurial preparations internally—calomel and mercurius solubilis Hahnemanni* are most frequently used in this manner. I order 0.5—1.0 of blue mass to be actively rubbed in every day upon portions of sound skin, of which enough may always be found in every case. When the ointment is rubbed in, in the evening, a bath may be given on the next morning without any detriment to the cure, and after that the inunction is repeated.

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* Black oxide of mercury.—Tr.

The local ulcers are best treated by the application of small compresses, wherever they can be applied—dipped in chamomile tea; the fissures and ulcers on the lips improve visibly by touching them several times with nitrate of silver. Baths, with corrosive sublimate, of which ℈i— ʒi is advised to be used in every bath, are expensive and dangerous to the child and its attendants, and, where the treatment is judiciously carried out with inunctions, may be dispensed with. The internal use of iodine can seldom be continued long enough in small children, for derangements of the digestion and a quicker progress of the marasmus are thereby frequently induced.

The diet should be as nutritious as possible. Children who are nurtured at their own mothers' breasts have the best chance of recovering. In artificially-fed children, the chief task will be the avoidance of diarrhœa, which may be attained by a carefully-prepared diet and demulcent drinks. When we succeed in this, the children will surmount the syphilis.

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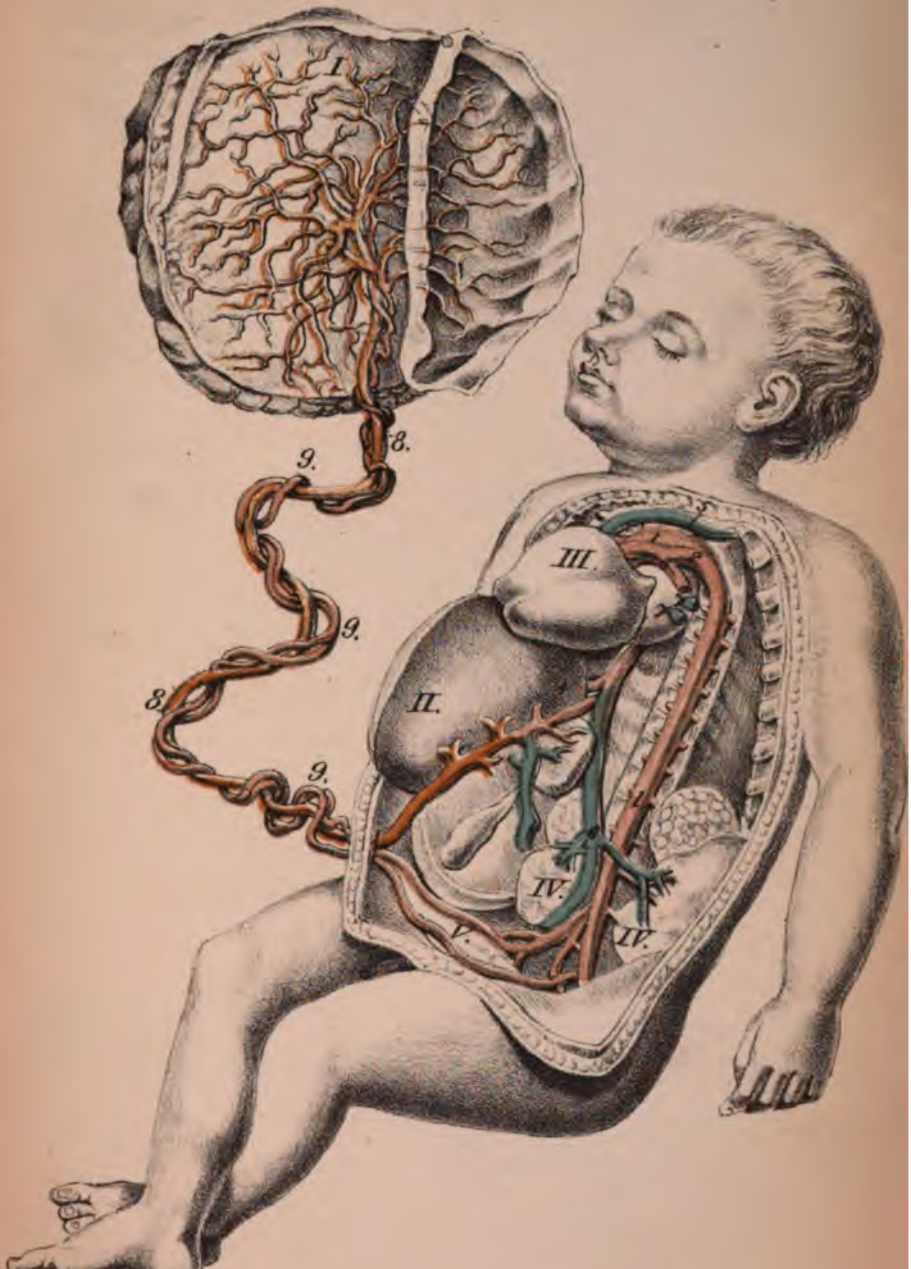

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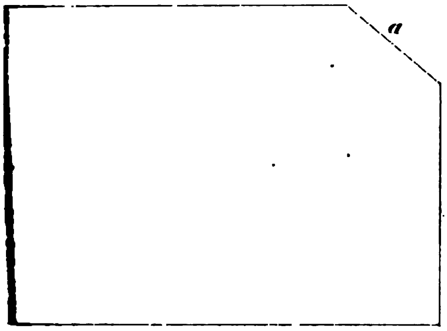

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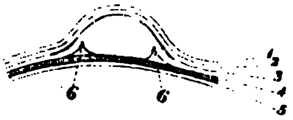

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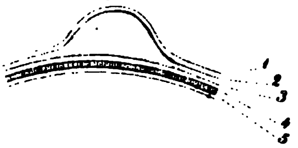

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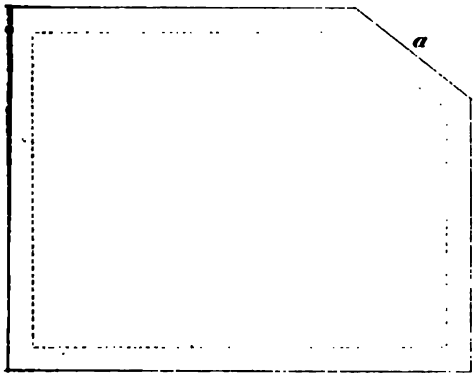

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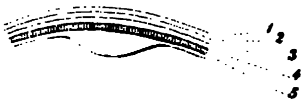

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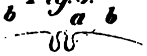

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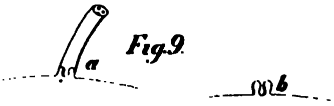

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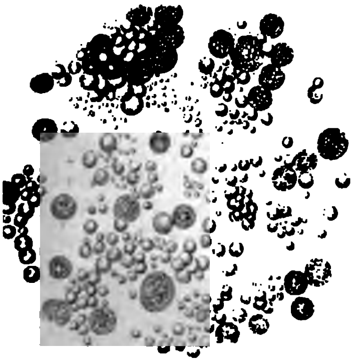

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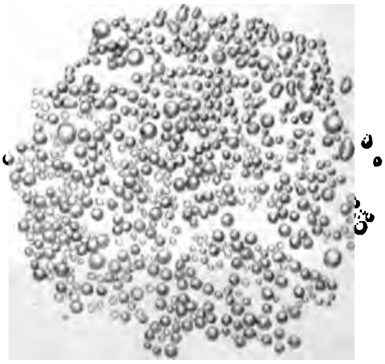

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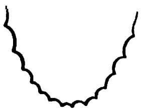

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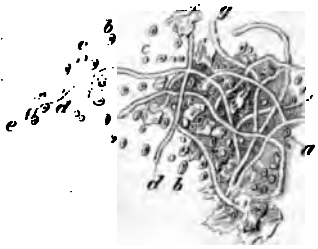

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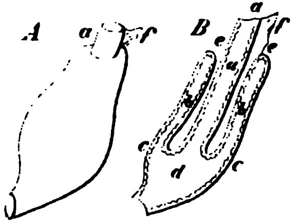

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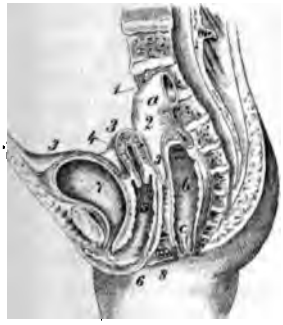

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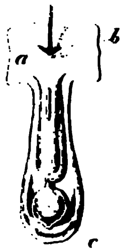

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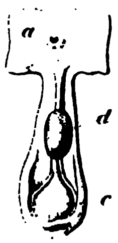

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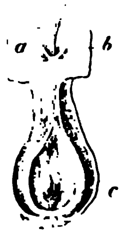

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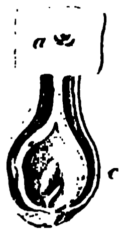

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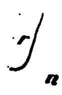

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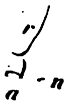

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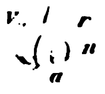

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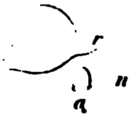

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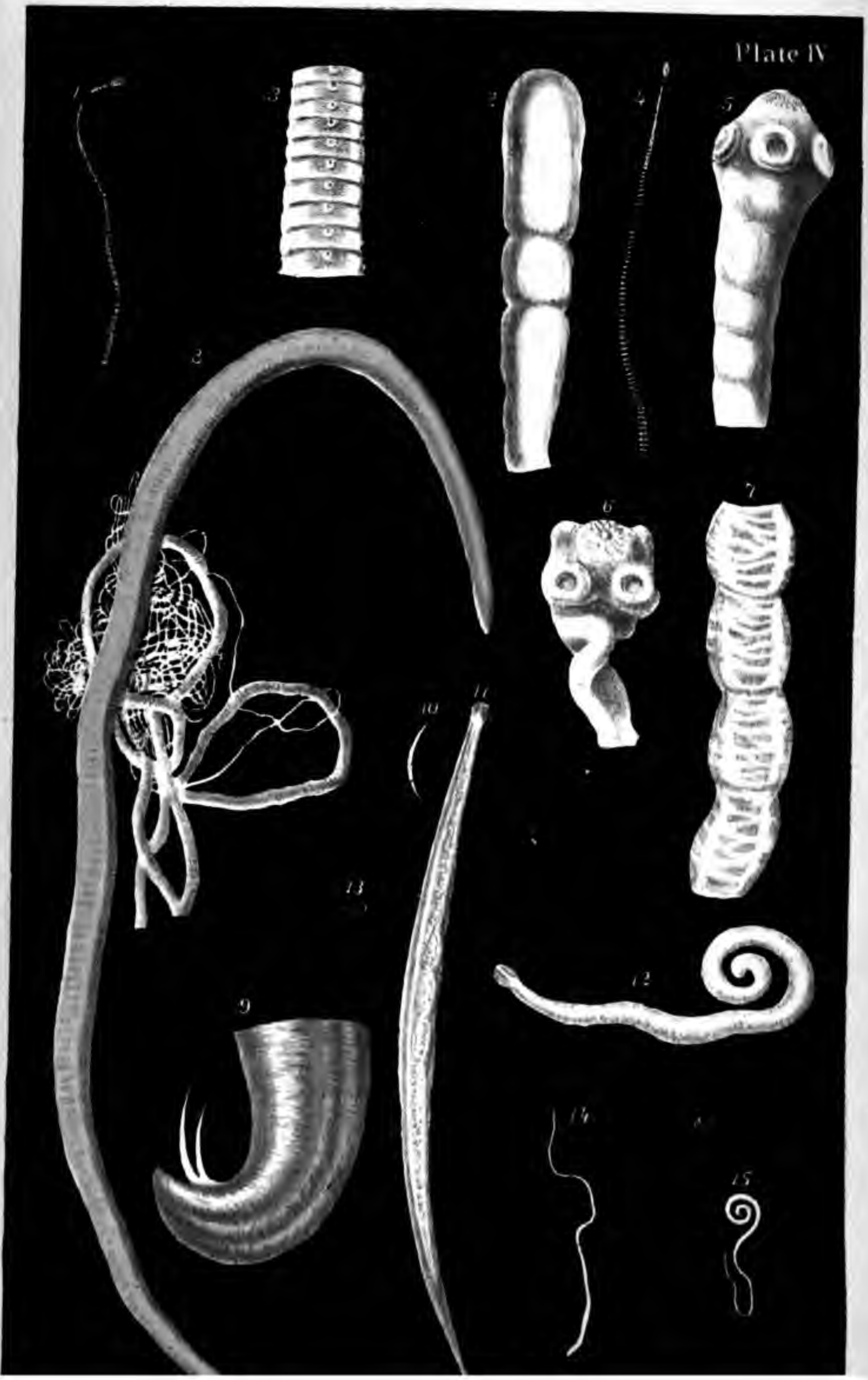

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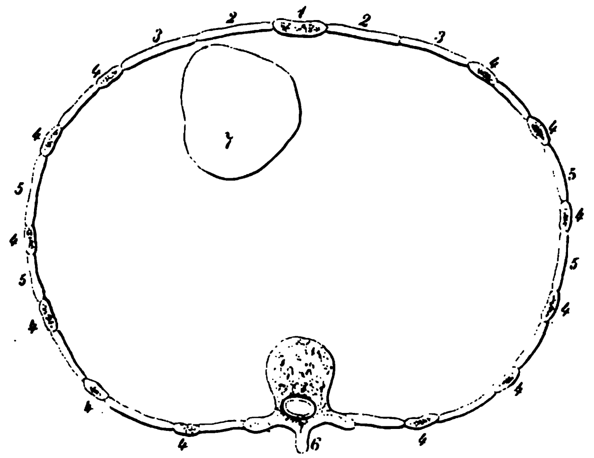

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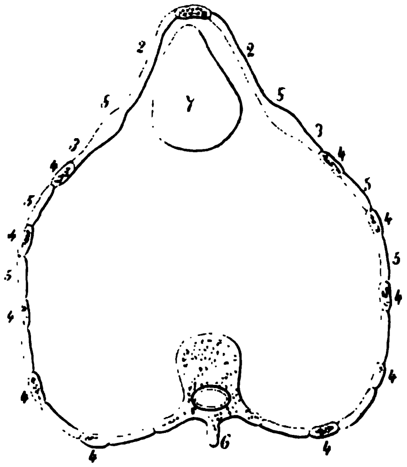

PLATE VI

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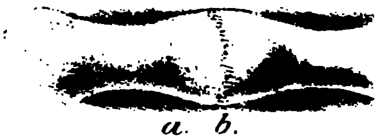

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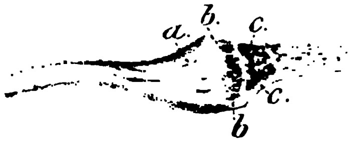

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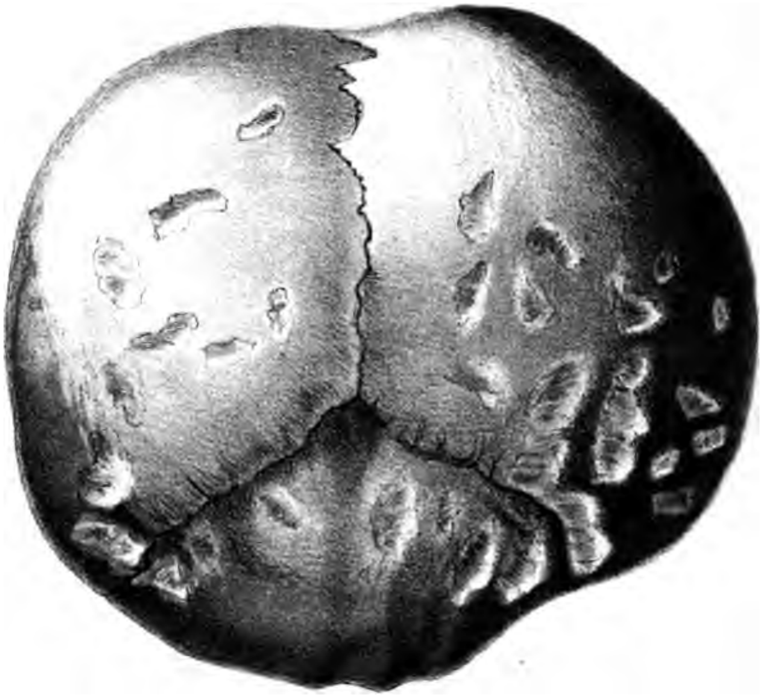

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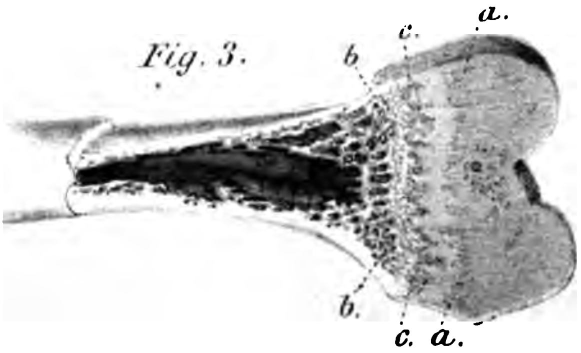

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